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The San Francisco earthquake and fire loss, although it will never be precisely known, seems at present writing to be likely to amount to between 250 and 300 million dollars, but a material portion of the burden is distributed by insurance in England and Germany. By other less direct methods the losses are shared by other countries; so that we may say there has occurred within a period of a few days a tremendous international calamity, a destruction of material and of the results of labor as absolute as the wastes of a long war. It is a loss to the whole country, and although it is unequally distributed, it is a hindrance in progress on the Atlantic Coast as well as on the Pacific and in the broad country between the oceans. The loss of property by the Southern Pacific and the Atchison is small in amount, and one might think, carelessly, that the roads leading into San Francisco would benefit by the carriage of material and persons during the progress of reconstruction. But this is not the lesson learned from the Chicago and Boston fires of a generation ago, or of the more recent Baltimore fire. It does not work out in that way. The San Francisco destruction of property is greater than our losses during the Spanish war, comparable to the English costs of the Boer war, something like one-third the cost to Japan and one-fifth the cost to Russia of their desperate campaigning. Nevertheless, it should be borne in mind that the amount of money needed to replace the destruction at San Francisco is only about one-quarter of one per cent. of our national wealth; a tax, but not a heavy tax, and not equally levied. There is another view, and an interesting one: Our country's wealth is increasing by as much as five billion dollars a year. At this rate, in May next the San Francisco loss will have been covered by the natural increment of growth in wealth. Or, put in another way, the nation loses by this disaster four weeks' time.

Some time ago, using as a basis for final comparison the savings bank returns for the year 1904, then the latest at hand, we pointed out the great and increasing degree to which the eastern savings banks were becoming absorbents of railroad bonds. The returns for 1905, now coming in, repeat the tale. The savings banks of Massachusetts and Connecticut combined had at the end of the fiscal year covered by the new reports the great sum of $953,676,617 as assets distributed among some 300 banks. The Massachusetts banks increased their holdings of railroad bonds during the year by $12,230,728 and the Connecticut banks by $8,062,765—the latter sum representing almost two-thirds of the total increase of assets of $12,896,930. In two New England states alone there were thus taken by savings banks last year $20,293,493 in railroad bonds, or a sum within about 20 per cent. of all the other investments of the year of the savings banks of the two states. It should be said that, in the Connecticut returns, railroad shares are merged with bonds, but the amount is so small that it may be ignored. Going outside of the banks the extent to which conservative institutions are taking up progressively railroad bonds may be illustrated by Harvard University, which ten years ago, out of total investments of $8,381,581 held railroad bonds amounting to $2,125,898, rising now to $6,241,828 in a total investment of $18,036,025. Of its total funds it had about a quarter in railroad bonds in 1895, now more than one-third. It is to be remembered, too, how the increased railroad bond investment has come in the face of the competition of industrial and other bonds during the last few years. The general subject broadens when we reflect on the great volume of railroad bonds of various kinds now pouring into the market—for improvements rather than new enterprise—and which, as offering high security at reduced prices, are likely to make the present a record year for conservative bond investments. They connote, however, fresh attempts in the legislative lobbies of highly capitalized states to secure for certain special classes of bonds savings bank legislation—attempts fraught with considerable investment dangers, saying nothing of legislative morals.

The Chicago, Milwaukee & St. Paul has at the present time, we believe, the largest equipment of compound locomotives (all Vauclain four-cylinder) of any road in the country, the number being 250—about 25 per cent. of its total locomotive equipment. And while most other roads have been changing over to simple such of this design of locomotive as they owned, the St. Paul is contemplating an increase in the number already on hand. The Union Pacific is second only to the St. Paul in the number of these locomotives in operation, using them in both passenger and freight service on certain divisions, where they are reported to show decided economies over simple engines in like service. It should be borne in mind, of course, that the most favorable operating conditions for compound locomotives are those which approximate most nearly to continuous running at constant speed and load, with the greater relative advantage at the slower speeds. Therefore, the physical character of the division over which they run and the tonnage back of them are the principal factors determining the quality of their performance. In the test in freight service on the St. Paul, which was described in the paper read at the April meeting of the Western Railway Club, and which was conducted as a thesis investigation by students of the University of Wisconsin, the final figure for fuel saving of the compound over the opposing simple engine was only 4.35 per cent. This was after rejecting runs of each where the engine was underloaded and the speed was high—obviously uneconomical conditions for either kind. The test was made between Chicago and Savanna, Ill. In discussing the small advantage shown by the compound, Mr. Manchester, Superintendent of Motive Power of the road, gave some figures from a 14 months' record on 11 compound and an equal number of simple engines on

this same division, which was very much in favor of the simples. They showed a less cost of coal per hundred ton miles, and the repair cost per mile run was less than half that of the compounds. Neither kind was in for general repairs during the period. On the other hand, on the La Crosse division, which is a slower division, and on which, we presume, the engines can be loaded more nearly to capacity, comparative records showed a coal economy for the compounds of from 18 to 35 per cent. It was evident from Mr. Manchester's experience that for certain divisions of the St. Paul and the service possible thereon the compound is best adapted, while conditions on other divisions enable simple locomotives to make the better showing. He further said that the compound is a locomotive on which the "stitch in time" is of greatest importance. The road using it must maintain a thorough and efficient roundhouse organization to assure its receiving continuous and proper care, otherwise it is much better not to have it. In this, of course, he was voicing the generally admitted cause for the commercial decline of the compound locomotive; for the lack of proper roundhouse facilities and of the proper skill and care in maintaining them has been the principal difficulty which caused the discarding of the compounds in so many cases. But the existence of practical difficulties of this nature, or the deficiencies of mechanical designs through which the endeavor has been made to take advantage of the compound principle, is no reason for condemning the principle itself. It is therefore encouraging to observe the interest that is being manifested in the latest application in American locomotive practice of the compound principle—the four-cylinder balanced type.

THE SUPERHEATER ON AMERICAN LOCOMOTIVES.

To say that history repeats itself is trite. Nevertheless, it is often interesting to call attention to repetitions, especially when they are as marked as in the case of introduction of the superheater in America. When the compound controversy was on there was a marked indifference to the results brought out in the reports of other roads. There seemed to be a prejudice against the type born of that conservatism inherited from the old schoolmaster mechanic who was averse to trying any experiments, and abnormally afraid of anything that added even in the least degree to the complication of the locomotive. Meanwhile the Germans and the French were hammering persistently at the compound problem until they achieved a success that warranted them in formally adopting the compound to the virtual exclusion of the simple type.

Hardly had these results been accomplished when they were offered another improvement that bid fair to cut down coal consumption still more. Recognizing the theoretical advantages of superheating, the Germans attacked the problem of designing and applying a suitable apparatus to work in connection with the locomotive boiler. There were discouragements without number. It was the unexpected that was continually happening, but each change of detail brought a measure of relief, until the superheater demonstrated that with its aid, on a simple engine, the coal consumption is less than upon a compound without it. This proven, there seems to have been no hesitation in adopting the superheater as a standard of construction, and thus introducing a new order of things. This is a perseverance that has been rewarded with success. But in America we are repeating the same old story of indifference.

In the compound controversy there was scarcely a superintendent of motive power in the country who took the slightest interest in making it a success; while the hostility in all quarters was intense almost to bitterness, as those who were interested in the introduction of the type fully understand. The compounds that were built were almost forced upon the railroads by the rival builders, for at that time, before the amalgamation of the locomotive works each concern was striving for business and anxious to make a record for its product.

Now comes the superheater, offering even greater theoretical advantages than the compound. It has won golden opinions from all sorts of people who have tried it. Its record for saving in boiler repairs is unsmirched. It permits the use of lower pressures, it involves but little extra complication, and in every way seems to be a desirable adjunct to the simple locomotive. Yet what is the American superintendent of motive power doing about it? Almost nothing. He is "letting the other fellow do the experimenting." He is quite comfortable in his willingness to wait and see, and since the competition of the locomotive builders has, to a great extent, been removed, they have not the same incentive to push the superheater that they had to develop the compound, and so there is not the same prominence given to it in discussion and the press. In this, history is not repeating itself, but it is repeating in the apparent indifference of the railroad man to an improvement that promises to effect a saving in fuel and boiler repairs, and thus increase the efficiency of the locomotive. That we will come to it in time there is no doubt, just as we have come to the Walschaert gear; but American progressiveness seems to be wanting when radical changes in locomotive practice are concerned.

The paper read at the April meeting of the New York Railroad Club, together with the discussion that followed should certainly have an educational influence. One road, the Canadian Pacific, that was the most advanced in the adoption of the compound, has come to the front as the most prominent advocate of the superheater, and the results there obtained must be most gratifying to the management. There the superheater has apparently come to stay, even to the exclusion and discarding of the compound, just as was done in Germany.

It does not seem likely that the superheater will be extensively used upon the compound, as the composite saving of the two systems is not enough in excess of the superheater alone to make the combination of the two worth while. As to the final form that the superheater will take, there is, as yet, no certainty. It seems now as though it would be of the smokebox type, though the tube superheaters are rendering a good account of themselves. This statement is based more upon the results obtained abroad than upon any evidence forthcoming in this country. Abroad, the tube superheaters were tried in order to avoid the troubles experienced with the smokebox type, with a reversion to the latter after the tube type had been well tried. But that our experience will be the same does not necessarily follow.

There is one lesson to be read out of all these experiences, and that is that the superheater has now been put into such shape that its economy has been demonstrated, and it behooves every superintendent of motive power who cares to maintain or attain a reputation for progressiveness to give it a trial—not a trial by simply putting one on a locomotive and then relegating the machine to the tender mercies of the hostler and the wiper, but a trial in which an intelligent interest is aroused in all who have to do with it—a personal interest in the results obtained that will show to subordinates that the head of the department means business, and that their co-operation is demanded in a way that will make for success and satisfaction.

THE HEPBURN BILL.

There are two strong economic reasons why Congress should pass what is commonly known as a rate bill this session. The first of these is that the small shipper under the present system suffers a grievous wrong in the delay of the law and the cost of litigation. If he is unjustly overcharged for the transportation of his freight, he has recourse to justice under the provisions of the Interstate Commerce Act, which provide that railroad rates for all such traffic as comes within the jurisdiction of the general government shall be just and reasonable, but so many delays are thrown in his path and the expense of court procedure is so great that to right any small injustice, or any pretty big injustice, which he has suffered, he will have to spend far more than he can hope to receive. The other reason is the existence at the present time of a strong public feeling against corporations in general and the railroads in particular, a public feeling which does not differentiate between wrongs for which the railroads are responsible and economic evils unavoidable in the growth of any great transportation system. As we have pointed out in these columns, this feeling cannot be disposed of by a policy of doing nothing. If a bill be not passed it seems sure that a national party will grow up, having as its principal platform a basis of hostility to railroads and to corporate interests which will do far more harm than any legislation now contemplated.

The difficulty with most of the earlier rate regulation measures has been that, aimed at rebates and discriminations, they failed to fully enlarge the powers of the Commission as to extortionate rates. Relief of rebate giving has nothing to do with the making of rates, for rebates are secret evasions of the rates as established, punishable by law; yet it is no exaggeration to say that this important fact is scarcely comprehended at all by the masses of voters at the present time. To enable the man who gives a rebate and the man who accepts a rebate to be punished, no long and elaborate act of legislation is necessary. The Elkins law allows the Interstate Commerce Commission to proceed by injunction against rebates and discriminations, but not against extortionate rates. The Foraker amendment to the

Hepburn bill adds to this the provision that the commission may also proceed by injunction against an extortionate rate.

If a clause similar to this Foraker amendment had been incorporated in the original Elkins bill, it seems probable that the present agitation would never have existed, at least along the present lines. Under existing law, if a shipper is charged an extortionate rate he can obtain redress under the common law, or before the commission, but the railroad is the defendant in the action, and it is to its interest to delay the proceedings. Under the amendment allowing the commission to proceed by injunction against an extortionate rate, the railroad is the defendant, but is enjoined from further charging that extortionate rate, and its interest lies in hastening instead of in retarding action. The difference between the two ways of adjusting a rate is extremely simple in its plan, yet it carries all the difference that there is between success and failure, and offers a far better remedy for the law's delay than can be given by any increased and complex system of special courts, or hearings before the commission.

It is unfortunate that this addition was not made to the Elkins bill. Since it was not, it can probably best be brought into effect through the medium of the Hepburn bill, and it is most desirable that it should be brought into effect, because it reaches a genuine evil in a simple and effective manner. But along with this good feature the Hepburn bill contains several bad features, and it is surely to the interest of all that these bad features should be amended or stricken out rather than that the good ones should lose their usefulness by being incorporated in a bill which contains unconstitutional provisions.

First of all, it is necessary to so frame legislation that the commission as constituted shall exercise constitutional functions; that it shall not attempt an impossible mingling of administrative, executive and judicial powers. The function of the commission is, of course, an administrative one. Congress has fixed a standard of rates—a broad standard it is true, but a standard nevertheless—in requiring that they be just and reasonable. The function of the commission is to see to it that they are just and reasonable, and to apply to the court for an injunction against them when they are not, or to decide the question itself after hearing. But in Section 15 of the Act to Regulate Commerce as amended by the Hepburn bill, it is provided "that the commission is authorized and empowered, and it shall be its duty whenever after full hearing, upon a complaint made as provided in Section 13 of this Act, or upon complaint of any common carrier, *it shall be of the opinion* that any of the rates or charges whatsoever demanded, charged or collected by any common carrier, subject to the provisions of this Act for the transportation of persons or property as defined in the first section of this Act, or that any regulation or practice whatsoever of such carrier or carriers affecting such rates are unjust, or unreasonable, or unjustly discriminatory, or unduly preferential or prejudicial, or otherwise in violation of any of the provisions of this Act, to determine and prescribe what will, *in its judgment*, be the just and reasonable and fairly remunerative rate or rates, charge or charges, to be thereafter observed in such case as the maximum to be charged; * * * and to make an order that the carrier shall cease and desist from such violation to the extent to which the commission finds the same to exist, etc." Now, there are two expressions in this paragraph as quoted which invalidate the chance that the commission can do good, because they require it to be judicial and legislative as well as administrative. As an administrative body the commission can do but one thing, and that is to see that rates comply with the standard set by Congress; to wit, that they be just and reasonable. The Act is clearly wrong in authorizing the commission to act *when it shall be of the opinion* and to prescribe what will, *in its judgment*, be just and reasonable. It may seem a simple point that Congress merely authorizes the commission to act when rates are unreasonable and not make their unreasonableness a matter of its judicial opinion, and to prescribe a rate which, *in its judgment*—a legislative act—will be reasonable, but on these distinctions apparently hangs the constitutionality of the paragraph and the usefulness of the Act.

The same point is further emphasized in the subsequent clause relative to joint rates, which prescribes that whenever the carrier or carriers shall fail to agree among themselves upon the apportionment or division of such joint rates, the commission may, after hearing, make a supplemental order prescribing the portion of such joint rate to be received by each carrier party thereto; and, after hearing on complaint, establish through routes and joint rates as the maximum to be charged and prescribe the terms and conditions under which such through routes shall be operated, etc. Bearing in mind always that the commission, being an administrative body, has its sole function in carrying out the expressed will of Congress that a rate shall be just and reasonable, and that, under the constitution, it can be neither an executive body nor a judicial body, the unconstitutionality of this paragraph is evident. Enforcing the standard of Congress with regard to the reasonableness of rates has no connection with prescribing "the terms and conditions under which through routes shall be operated." As a matter of fact, carriers always decide these matters among themselves; but, if they did not, the commission has no standard to go by, for no standard has been fixed by Congress, and therefore it would clearly be powerless and would exceed its constitutional functions if it attempted to make an order prescribing terms and conditions, for the operation of through routes includes the number of trains which may be run, the speed at which these trains must be run, and a host of other particulars for which Congress has given no standard. The clause, therefore, confers the entire absolute legislative power of Congress on the commission, and this cannot be done. It is true that it is prescribed in the same paragraph that the commission is to perform these acts when "the carriers complained of have refused or neglected to voluntarily establish such through routes and joint rates, provided no reasonable or satisfactory through rate exists." This limits the provisions but does not save the constitutionality.

Another clause doubtless unconstitutional in itself, but which would presumably not render the whole bill unconstitutional, is that providing that any carrier, any officer, representative or agent of a carrier, etc., who knowingly fails or neglects to obey any order made under the provisions of Section 15 of this Act, shall forfeit to the United States the sum of $5,000 for each offense, and in case of a continuing violation each day shall be deemed a separate offense. In the case of a contested ruling it is easy to see that this provision might pile up a tremendous fine against a railroad acting with honorable intentions, and that, under these circumstances, the courts would adjudge the penalty a cruel and excessive one, and thereby unconstitutional.

Apparently as a result of the careless and hasty change in the bill as presented, a curiously objectionable paragraph appears on page 16 of the Hepburn bill as printed, lines 18 and following. In the original bill formulated by the Interstate Commerce Commission, it was provided, properly, that if a carrier did not show grounds of objection to a ruling of the commission within 60 days after the ruling was promulgated, the carrier was subsequently to be estopped from making objections to the enforcement of the ruling on any other grounds than those of improper form in making and serving the order. Now, the Hepburn bill is, of course, the commission's bill, with certain modifications. One of these modifications, made by the pending bill, was to strike out the court review provision. This was done in such a way that the act now prescribes that when a carrier fails or neglects to obey any order of the commission, other than for the payment of money, while the same is in effect, any party injured thereby or the commission in its own name may apply to the circuit court in the district where such carrier has its principal operating office or in which the violation or disobedience of such order shall happen, for an enforcement of the law. With the provision for court review and the 60-day period stricken out, it now reads that if it appears to the court upon hearing that the order was regularly made and duly served, and that the carrier is in disobedience to the same, the court shall enforce obedience by a writ of injunction and the carrier shall be prohibited from showing any objection except in the form of the order and the way in which it has been served. It seems clear that this provision, owing to this careless striking out of a clause, is an unconstitutional one, involving the taking of property without due process of law.

One other clause of the Hepburn bill is very objectionable, not so much on the ground that it is unconstitutional as on the ground that it is foolish. It is prescribed, very properly, that the commission shall at all times have access to all accounts, records and memoranda kept by carriers subject to the Act. It is also prescribed, most absurdly, that it shall be unlawful for such carriers to keep any other accounts, records or memoranda than those prescribed or approved by the commission. It is obvious that each railroad has its own special forms of traffic that need special ways of accounting. It is highly desirable that uniform accounts covering the main transactions should be faithfully kept and open at all times to the commission, but it is most childish to prohibit the roads from keeping records of branches of their business which may not have occurred to the commission at all in laying down their prescribed forms. The statement is actually so sweeping that if the Philadelphia & Reading, for example, should keep a special

record for its own information of the amount of coal business done by one of its competitors, say, the Lehigh Valley, and if the commission did not specifically provide for this record, it would thereby be illegal. Such a provision has a Russian sound and bears no analogy to American customs and practice.

Let us grant, then, that a bill must be passed, and that the Hepburn bill comes as close to what is necessary as any measure which can be enacted under the present congressional situation. Does it not seem wholly wise and expedient that the clauses which are objectionable and unconstitutional should be amended or stricken out in order that actual good may be done, especially in removing the evil of the law's delay? An unconstitutional bill will harm no one directly, but in the present state of tension seems sure to lead to hasty and dangerous action, not only by the law making bodies of the country, but by a body of voters who cannot discriminate between justice and revenge.

March Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of March, printed in another column, contains accounts of 28 collisions, 20 derailments, and two other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

Mar.	Place.	Killed.	Injured.
2d	Wendover, Wyo.	1	2
2d	Thurmond, W. Va.	1	0
7th	Saratoga, N. Y.	4	10
7th	Binghamton, N. Y.	0	2
11th	Fostoria, Ohio.	3	2
16th	Adobe, Colo.	22	22
17th	West Windham, N. H.	3	3
19th	Lockbridge, Ia.	5	8
25th	Carthage, Texas.	3	12
26th	Casper, Wyo.	9	12
30th	South Whitley, Ind.	0	19
31st	Gaffney, S. C.	3	0
31st	Fulton, N. Mex.	0	16

Thirty-one of the 54 killed in these 13 accidents were the victims of the two worst, Adobe and Casper. Adobe was the subject of editorial comment in our issue of March 23, and of comment by a correspondent in the issue of April 6, page 348. While not insensible to our correspondent's plea for more charity, we cannot see that his view differs materially from our own. He recognizes the need of a reasonable degree of age and experience in an operator who is to attend a train-order office at night, and that, no doubt, is just what was the trouble. The force of our correspondent's phrase "criminally indifferent" depends on the operator's age and experience. One can imagine an operator so young that he does not realize the gravity of his responsibilities, and such a condition tends to relieve him of the burden of guilt and to throw it on the superintendent or employer, who is bound to realize. But it is difficult to imagine a person capable of learning to read and write and telegraph, and secure a position under a competent superintendent, who is so young or so dull as not to realize the wrong of claiming to have been even partly awake when he knows that he has been partly asleep. The operator who sits at his desk, sleeps several minutes, awakes, and does not realize that he has been asleep, does so, we believe, only after he has made a number of experiments in that line. On his first experience he is alarmed. It is after repeated trials that he becomes sufficiently hardened to do it without being alarmed. Therefore we call such conduct morally vicious.

The number of electric car accidents reported in the newspapers of the United States as occurring in the month of March was five, in which one person was killed and 31 were injured.

The State of North Carolina, while not among the foremost of the railroad states of the Union, ranks well in the list with her main trackage of 3,859 miles. The fact gives added interest to the constitution and functions of the body that serves as her railroad commission and which are set forth in the last commission report, for the year 1905, which contains the railroad statutes as revised and brought down to the present date, including the legislative session of 1905. The state has not a railroad commission properly and exclusively. It has, instead, a "corporation commission," so called and named in the statute as a "court." It consists of three officers whom we may call either commissioners or judges, elected by the people and thus, by that fact, thrown into the limbo of caucuses, conventions, general politics and pulls. No member of the commission can "jointly, severally, or in any other way, either directly or indirectly, hold any stock or bond or be the agent, attorney or employee, or have any interest in any way in any steamboat, canal, navigation, express, telegraph, bank, building or loan company or association," and under heavy penalty must get rid of any such interest if he happens to acquire them by inheritance or otherwise. The commission thus, so to speak, divested of investments, is given most extensive and varied powers. It is a body advisory, supervisory, judicial, regulative and clerical all in one. It takes purview of railroads, street railways, electric power companies, banks, telephones, transportation and public service corporations generally. Its powers are too ample to be described herefully, but they reach out and pretty radically into almost every branch of up-to-date questions relating to public service corporations, including freights and fares; and, besides, the body is constituted a board of "state tax commissioners," with the usual functions of such a body. The tasks, duties and responsibilities which states much smaller than North Carolina distribute among several bodies, that state loads on a single commission with such multiplied and varied offices as would make the best trained economist dizzy. And we cite the case of North Carolina, not so much as an exception, but as a type of the way other states, by their creative and organizing statutes, establish "overloaded" commissions to handle grave railroad problems and metaphorically make up such a heavy train as no locomotive can pull. Incidentally one is tempted to ask why North Carolina, after cutting off her commission from so many forms of corporation investment, didn't push consistency further and, as tax commissioners, cut them off from property owning entirely and create a commission *in forma pauperis*.

Texas & Pacific.

This company, operating 1,826 miles of main line in the Southwest, the stronghold of the Gould system, furnishes an arm reaching through Texas as far west as El Paso. Its eastern terminus is New Orleans. In the eastern half of the distance between the two termini there are several hundred miles of branches and connecting lines. On the other hand, over the 613 miles between Fort Worth and El Paso the main line constitutes the whole of the company's property, with the exception of a six-mile branch to coal mines. Judged either from a tonnage or revenue standpoint, through freight traffic is more important than local tonnage. Competitive freight furnished 2,374,125 tons out of the total tonnage of 4,156,701 tons carried. Competitive freight earnings were $4,487,385, against $3,355,844 revenue from local freight traffic. Of the 2,044,309 passengers carried, only 285,417 were local passengers, showing that the through line of the company is much more important for freight than for passenger traffic. Of course, the great handicap of this Gould spur to El Paso is that its western connection at El Paso is the Southern Pacific, which has its own line between El Paso and New Orleans, and which consequently could hardly be expected to turn over a great proportion of traffic to its rival. On Mexican business, however, the Texas & Pacific further fortifies the strong position of the Goulds, since it gives a connection for the Mexican Central's traffic at El Paso, just as the International & Great Northern interchanges with the National of Mexico at Laredo.

As a local line, the territory through which the Texas & Pacific runs in Louisiana and northeastern Texas furnishes cotton and lumber traffic. The western half of the line between Fort Worth and El Paso has been largely until recently unsettled prairie country. It is now, however, being steadily taken up by new settlers, who are finding the land rich in agricultural possibilities. During the past year the passenger traffic of the road, although not quite as large as in 1904, was swelled by the large number of settlers carried westward; this business, of course, not adding to earnings to the extent that first-class business would do. The freight traffic was at the same time increased by large growth in shipments of fruits and vegetables, particularly on this formerly undeveloped Rio Grande division west of Fort Worth. On this division alone there was an increase of 1,743 carloads of oranges, lemons, green fruits and vegetables carried.

A season of heavy rainfall in the last half of the year decreased the yield of small grains and cotton. This was followed by the yellow fever epidemic in Louisiana, which seriously interrupted passenger traffic, delayed greatly the movement of merchandise, and to some extent increased the cost of transportation. As a result, gross earnings decreased $302,757, or 2.43 per cent., and net earnings $401,230, or 9.27 per cent.

The record of the Texas & Pacific's earnings shows that the past 10 years may be roughly divided into two equal periods. Gross earnings from 1896 to 1899 showed considerable gains; in 1900 there was an increase in gross of $1,450,000, and in 1901 of over $2,000,000. In the five years since then there have been in three of the years comparatively small increases in gross earnings, and in two years decreases. Gross earnings in 1905 were $12,130,391 ($6,643 per mile), operating expenses $8,210,166, and net earnings $3,290,225. Freight earnings decreased $164,763, or 2 per cent., and passenger earnings $146,861, or 5 per cent. In view of the almost complete suspension of passenger traffic on the Louisiana lines during the three months of July, August and September owing to the quarantine, it is remarkable that there was not a larger decrease in total passenger earnings. It is probable that in common with the other Gould lines in the Southwest the passenger earnings in 1904 were considerably swelled by travel to the St. Louis Fair.

Damage to the cotton crop is reflected in the total number of bales moved, which was 720,993, compared with 830,012 in the pre-

vious year. The revenue received per bale was also less than in 1904, being $1.23 against $1.34 in the earlier year. Of the cotton carried, Texas furnished more than half, Louisiana the rest. There was also a decrease in the tonnage of cane sugar moved and in the shipments of rice, but an incerase in shipments of sugar and molasses. Out of the total of 4,156,701 tons carried, 909,737 tons were manufactures, merchandise, etc., a larger figure than that of the tonnage of mine products, including coal.

The road is fairly well, but by no means liberally, maintained. Maintenance of way cost $707 per mile, which is perhaps not too small for a road so much of whose line runs through Texas prairies, with one, or, at most, two, passenger trains a day each way. In 1904 the figure was $729 a mile. Repairs and renewals cost $1,624 per locomotive, against $1,819 in 1904; $955 per passenger car, against $940 in 1904, and $47 per freight car, against $46 in 1904. These amounts are probably sufficient to keep the equipment in repair, but hardly represent any equity in concealed earnings. Of the $783,286 spent on improvement account during the year, $557,595 was charged to income.

There has been another increase in the average car load and train load, as uniformly for the past few years. Ten years ago, in 1896, the average car load was 10.37 tons, and the average train carried 153 tons. Last year the car load was 13½ tons and the train load 215 tons, the latter an increase of four tons over the preceding year. These are small increases compared with those on most Eastern trunk lines.

There were 20,498,474 bushels of corn exported from the port of New Orleans during 1905. The Texas & Pacific elevators at Westwego, eight miles from New Orleans, handled 7,809,304 bushels of corn. As compared with the 549,356 bushels of wheat exported through New Orleans, there were 627,224 bushels handled at T. & P. elevators. Much of this grain, of course, was not exported.

The branch line mileage in Louisiana was increased during the year by the extension of the Avoyelles line, 22 miles beyond its former terminus to a junction with the main line, thus making a complete loop through this agricultural region of Louisiana. In spite of this fact main-line mileage operated and the length of the Avoyelles branch are given in the mileage statistics the same as in the preceding year.

The principal statistics of operation are given below:

	1905.	1904.
Mileage worked	1,826	1,826
Freight earnings	$8,243,229	$8,407,992
Passenger earnings	2,714,881	2,861,742
Gross earnings	12,130,391	12,433,148
Maint. way and structures	1,290,685	1,331,901
Maint. of equipment	1,371,413	1,373,451
Conducting transportation	5,124,373	5,018,288
Operating expenses	8,210,166	8,111,692
Net earnings	3,920,225	4,321,455
App. out of income for impvmts	557,595	700,584

Vandalia Railroad.

On January 1, 1905, the Terra Haute & Indianapolis, the St. Louis, Vandalia & Terre Haute, the Terre Haute & Logansport, the Logansport & Toledo, and the Indianapolis & Vincennes railroads, Pennsylvania allied lines radiating from Indianapolis and Terre Haute, were consolidated as the Vandalia Railroad Company. This consolidation had for years been delayed by litigation, during which time some of the advantages of union were gained by operation under the informal title of the Vandalia Line. With the ending of the important suits at law, formal merger was made and the report of the first year's operation of the consolidated company, with its 658 miles of line, is now at hand. In this, comparisons are made with the totals of the lines as operated separately during the preceding year. The results of operation of the Terre Haute & Peoria, with 145 miles of line, operated separately, are included under separate tables.

The Vandalia earned gross $7,195,877, a decrease of $400,000 from the preceding year. There was an increase of $353,300, or 8 per cent., in freight earnings, the decrease in gross resulting from a loss of $692,200, or 28 per cent., in earnings from passenger traffic, due to comparison with an abnormal year, when these roads carried so large a proportion of traffic to the Louisiana Purchase Exposition at St. Louis. Operating expenses decreased $264,381, leaving net earnings of $1,642,210, a decrease of $135,000. The Terre Haute & Peoria earned $649,346 gross and $52,958 net. The rental of the road (30 per cent. of gross earnings) was $194,804, leaving a loss to the controlling company of $141,845 on the year's operation.

Maintenance of way cost the Vandalia $1,383 a mile, against $1,197 a mile in 1904. Repairs of equipment cost $2,460 per locomotive, against $3,553 in 1904, a decrease of over $1,000 a locomotive; $1,064 per passenger car against $821 in 1904, an increase of over $200 per passenger car, and $76 per freight car against $75 in 1904. Apparently heavy expenditures for repairs of passenger cars came after the Exposition closed, when there was chance for a general overhauling.

The principal articles of traffic were bituminous coal, lumber, manufactures, grain and livestock. There was a large increase in the tonnage of manufactures carried, which totaled 1,197,548 tons, an increase of 208,120 tons over 1904. The train load increased 20 tons over 1904 to 264 tons. The number of tons carried one mile per mile of road was 959,668, an increase of 105,933.

Passengers one mile per mile of road decreased over 50 per cent., from 204,132 to 125,606. Passenger earnings per mile of road were $2,697, against $3,766 in 1904, a decrease of $1,069 per mile. The number of passengers carried one mile decreased 38 per cent., while the average rate received per passenger mile, 2.06 cents, increased, being 1.84 cents in 1904.

The Vandalia furnishes the Pennsylvania Lines with entrance into St. Louis and on that account can always count on a large and steady through traffic. The local lines of the system are much less important, but as a whole the road gets a fair share of local traffic in Illinois and Indiana.

The principal statistics of operation for the Vandalia Railroad follow:

	1905.	1904.
Mileage worked	658	658
Freight earnings	$4,675,742	$4,322,431
Passenger earnings	1,775,291	2,467,579
Gross earnings	7,195,877	7,594,946
Maint. way and structures	909,785	787,518
Maint. of equipment	1,228,049	1,334,132
Conducting transportation:		
Traffic	198,767	202,280
Operation	2,833,683	3,108,822
Operating expenses	5,553,667	5,818,048
Net earnings	1,642,210	1,776,899
Net income.	1,676,481	2,066,815

NEW PUBLICATIONS.

The Heart of the Railroad Problem. By Frank Parsons, Ph.D. Little, Brown & Co., 254 Washington St., Boston. 364 pages. $1.50.

Professor Parsons' book, in which he takes up in great detail and with commendable thoroughness all the more conspicuous abuses connected with railroad practice, might be described as a lamentation without a remedy. A book of 364 pages is a substantial document and the writer has evidently spent much time in securing a vast number of instances of iniquitous rates and rate making practice. On this account his book has considerable historical value and will be of interest in future years to the man who wishes to find out the way the railroads secured competitive business in accordance with the law, behind the law, and in spite of the law. Unfortunately the author's attitude of mind is not impartial. It does not pretend to be impartial. In treating of the long and short haul clause Professor Parsons is apparently at once puzzled and dissatisfied by the provision that similar conditions must exist to render the law effective as to two transportation routes under consideration. He cites with the greatest length cases where long hauls are cheaper than short hauls, but can either see no reason why they should be so or does not care to explain this reason. This is only one instance to show that the book is not going to be a helpful one in arriving at any solution of the difficulties which actually exist. He clearly holds the view that one of two things must be true; either that the long haul charge is the fair one or else that the higher short haul charge makes up deficiencies in the rate for the longer haul, and seems unable to grasp the fact that long haul business which keeps cars moving and secures some traffic to help pay fixed charges on an existing line, thereby reduces the short haul rates which it is necessary to charge. This lack of judicial balance and this confusion of thought makes it natural that the author should be unable to suggest any remedy for the evils he mentions. As a matter of fact, he has none to suggest, except the very pleasing and very visionary one that the railroads all unite into a national system under a great leader, like James J. Hill or A. J. Cassatt, who would operate the roads on business principles untrammeled by the spoils system or any political control, backed by a public interest that would not tolerate favoritism, managing the roads for the whole people as stockholders, etc. We have not counted the specific kinds of injustice which Professor Parsons enumerates in his book. We imagine there are about a hundred, and we are old fashioned enough to think that Professor Parsons' remedy, working at its best and most impractical summit of efficiency, would not remove more than possibly three of these kinds of injustice.

TRADE CATALOGUES.

Noiseless Brake Hanger.—A well illustrated catalogue describing the "Brill" noiseless brake hanger is being sent out by the J. G. Brill Company, Philadelphia. The principle feature of the device is a ball and socket joint with the cap socket held firmly in place by a wedge which, as the socket becomes worn, is advanced by a pair of springs.

The Northern Pacific is advertising itself in a very appropriate and modest way by circulating samples of the bill of fare which was issued for the Easter day dinner in its dining cars. Whether the passenger department will care to be complimented on the modesty of an advertisement we do not know; but a modest menu is always appropriate. This one is handsome as well—though we

have never been able to find any suggestion of either high speed or low prices in the Northern Pacific red and black trade mark. That the Northern Pacific viands are all right goes without saying; and there is an Easter verse. On a separate souvenir card is a striking picture of a Yellowstone Park scene.

Steam Shovel News.—The April number of this journal has for its leading article a reproduction of that portion of Mr. Jno. F. Wallace's address to the Illinois Manufacturers' Association at Chicago on March 2 (*Railroad Gazette*, April 13) as pertained to the Tehuantepec Railroad. There are also notes regarding Lake Shore improvements and "Nickel Plate" betterments; railroad extensions to the Gulf; an Alaska railroad, and other information of general interest to contractors and railroad builders.

Quarrying Machinery.—The Ingersoll-Rand Company sends a small illustrated pamphlet showing track channelers and drills; the heavier channelers can be driven either by steam with independent boilers or by air from a central compressor.

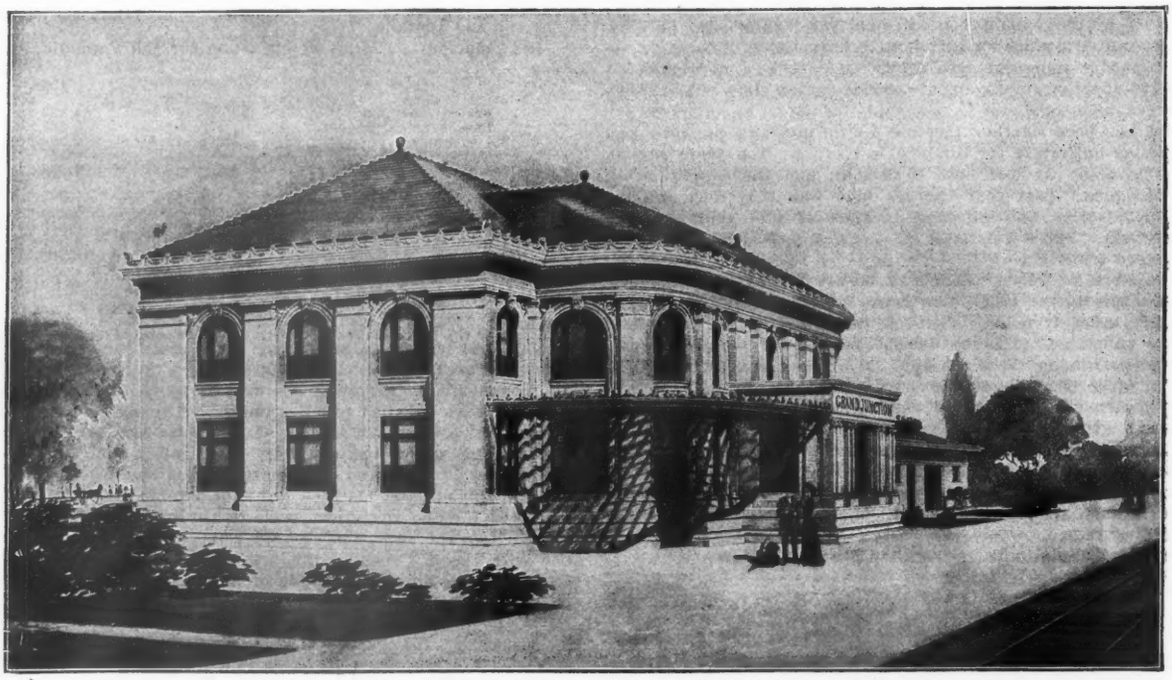
Graphite Paint.—"Preservation of Structural Steel and Iron" is the title of a 20-page pamphlet of pleasing design sent by the Chicago Graphite Manufacturing Co. A discussion of the merits of various pigments considered desirable for protecting iron and steel structures is given, with a presentation in detail regarding this company's product. There are also a number of half-tone engravings from photographs of various structures, the steel and iron in which is protected by its paint.

Turntable Tractors.—The designs of locomotive turntable tractors made by Geo. P. Nichols & Bro., Chicago, are described and illustrated in a neat pamphlet just issued. The most satisfactory form is stated to be the electric, and a number of photographic views of their application on tables for different roads are presented. A brief description of the design is given, and of the dead-engine haul provided when desired. Gasoline tractors are supplied where electric current is not available. Mention is also made of transfer tables for rectangular engine houses and a view of an installation shown.

Pneumatic Turntable Motor.—A 14-page pamphlet issued by the Draper Manufacturing Co., Port Huron, Mich., describes the McGrath pneumatic turntable motor and shows a number of half-tone engravings from photographs of its application on several well-known roads. A list of other roads is given, including 16 of the most important in the country.

New Passenger Station at Grand Junction, Colorado.

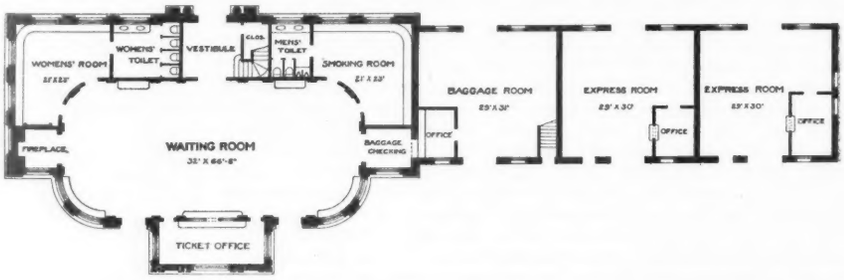
A new station at Grand Junction, Colorado, was on April 17 opened for service by the Denver & Rio Grande Railroad. It is illustrated herewith by a photograph and floor plan. The new station emphasizes in a striking way the progress of Colorado and the efforts being made by the Denver & Rio Grande to provide for its patrons comfortable, convenient and even luxurious facilities. Although Grand Junction, according to eastern standards, is not a large city, it is the center of a large and productive territory, and the center of the Denver & Rio Grande's east and west system. The management therefore decided that it was appropriate to provide a distinctive style of station rather than the stereotyped style so familiar to the traveling public.



New Station of the Denver & Rio Grande at Grand Junction, Colorado.

The design of the exterior of the building is a fine example of the French renaissance style. The whole is built in the best and most durable materials. The foundation is of concrete resting on Raymond concrete piles driven to hard-pan and the construction throughout is largely fireproofed with reinforced concrete. Hard burned, rich colored buff brick is used for the body of the exterior walls, and trimmings of light terra cotta to match the brick are liberally used. The roof is covered with clay tiles of a rich red color, blending agreeably with the light warm tones of the walls.

The buiding consists of a large two-story central portion containing the waiting rooms, etc., and a single story addition at one end containing the baggage room and two express rooms. It is proposed to make a similar extension on the other end of the central portion at some future time to provide a lunch room, kitchen and a large open pavilion. The front of the building is at present provided with large ornamental iron canopies with wire glass roofs.



Floor Plan of New Passenger Station of the Denver & Rio Grande at Grand Junction.

The plan of the interior was evolved after much study and is of a type likely to become popular for buildings of this class. It provides generous light and convenient and airy

facilities for the accommodation of travelers. The doors on each side of the building open into the magnificent general waiting room 32 ft. x 67 ft. in size and running up through two stories to a height of 25 ft. The finish of the waiting room is elaborate, the walls being divided into panels by pilasters which support a richly modeled cornice and paneled ceiling in plaster. Stained glass has been much used in this room; wall decorations are of stained burlap, and ceilings of fresco. The ticket office opens from the main waiting room toward the track front of building, forming the one-story porch shown in the photograph, making a convenient arrangement both for the public and for the operating force. The checking alcove is conveniently situated at one end of the waiting room and the retiring rooms for men and women are easily accessible from the rear corners of the waiting room. A commodious lobby at the rear of the waiting room contains the stairs leading to the second story rooms, which are provided for the Division Superintendent's offices, trainmen's rooms and the despatcher's and telegraph offices, with the necessary toilet and locker rooms. The wood finish of the various rooms is of quartered oak throughout and the floors are of tile and cement. The artificial lighting is done by electricity, many incandescent and Nernst lamps being used. The heating is by the vacuum system of steam circulation, the steam supplied from a central plant in the Grand Junction yards.

The design of the building was furnished by Mr. Henry J. Schlacks, of Chicago, and the general contract for the building was carried out by the William Simpson Construction Company, of Denver, Colorado.

Superheated Steam on the Canadian Pacific Railway.

At the April meeting of the New York Railroad Club, Mr. H. H. Vaughan, S.M.P., of the Canadian Pacific Railway, read the paper of the evening. From this it appears that during the past year a number of locomotives have been equipped with superheaters in addition to those in use at that time, all of which are of new construction. The types of superheaters used are the Schmidt fire tube, a modification of the Schenectady, which may be called the Schenectady B, and one designed by Mr. A. W. Horsey, Mechanical Engineer of the Canadian Pacific, and the writer which will be called the "C. P. R." The complete list of engines so equipped follows, those marked X being on order and not yet delivered.

Type of superheater.	Class of engine.	No. equipd.	Weight of engine.	Size of cylinders.	Size of drivers.	Type of engine.
Schmidt.....	700	10	190,000	21x28	63 ins.	10-wheel simple
Schenectady B.	710	55	190,000	21x28	63 "	10-wheel simple
C. P. R.....	740	30	190,000	21x28	63 "	10-wheel simple
C. P. R.....	820	1	164,000	20x26	69 "	10-wheel simple
C. P. R.....	780	5	190,000	21x28	63 "	Do., W. F.
C. P. R.....	1,150	3	215,000	21x28	69 "	Pacific.
X C. P. R....	7,000	15	190,000	21x28	63 "	10-wheel simple
X C. P. R....	1,100	3	215,000	21x28	75 "	Pacific.
X C. P. R....	1,640	20	185,000	21x28	57 "	Consolidation simple.

This makes a total of 186 engines built or being built of the superheater type.

In the case of the Schmidt fire tube superheater, the only alteration made in the "Schmidt" design has been the substitution of separate bolting for each flange connecting the superheater pipes to the header in place of using clips as in the original design. This has entirely overcome the trouble from leakage previously experienced, and while a small change, is a considerable improvement.

The "Schenectady" superheater used on the 1621 class employed the "Field" tube type of superheater pipe in which steam is led from the saturated steam header through the small tube to the rear end of an inch and three-quarter tube attached to the superheated steam header. The fire-tubes are 3½ in. in diameter, and each contains one 1¾-in. superheater pipe. In the "Schenectady B" type of superheater, with which the 710 class engines are equipped, the well known design of "Schenectady" header is retained, but the superheater pipe and fire-tube arrangement is the same as in the "Schmidt" and C. P. R. design, namely, 22 fire-tubes 5 in. in diameter, each containing four 1⅛-in. superheater pipes of which the back ends are connected in pairs by return bends while the front ends are connected in pairs to the saturated and superheated steam headers respectively.

The arrangement of the front end and the superheater tubes of the "C. P. R." superheater is shown in the illustrations. Steam from the dry pipe enters the top or saturated steam header, as shown in detail, and flows through the fingers of the header into 1¼ in. solid drawn weldless steel tubes, inside diameter $^{15}/_{16}$ in. These tubes are upset at one end and are forged and bent by a bolt header and bending machine to the shape shown. They are connected by bronze union nuts to special cast-steel fittings which screw into the header; a $^{1}/_{16}$ in. copper wire gasket being used in the union nut. As shown, these small tubes extend into large 5 in. superheater fire-tubes to within about 30 in. of the back tube sheet, where they connect with the heavy cast-steel return bends. The steam returns from the return bend through 1¼ in. tubes, which connect through union nuts and special cast-steel fittings, similar to those mentioned above, with the fingers of the bottom-header, which is shown in detail. The steam pipes which connect this header with the cylinder casting are necessarily very short; however, there has been no difficulty in making the joints tight. Each large superheater fire-tube contains two of the small tubes from the top header and the corresponding return tubes to the low header. The return bend has lugs cast on it, which spaces it properly from the sides of the large tube and the other set of small tubes so that there is a uniform circulation space about the small tubes. The cast-steel return bend is made especially heavy at that part which comes in contact with the smoke and gases from the firebox.

It will be seen that the "Schmidt," "Schenectady" and "C. P. R." superheaters now being applied on the Canadian Pacific are identical in every respect with the exception of the arrangement of the headers and the connection to them to the superheater pipes. The primary object sought in the design of the "C. P. R." type were the separation of the joints from the heater pipes to the headers, the location of these joints in a position where they could be conveniently inspected and an arrangement of the superheater pipes that would permit any individual element being removed or applied without disturbing the others. These objects appeared desirable after the experience on earlier engines, and it is evident they have been very satisfactorily obtained. The first is also satisfactorily met in the "Schmidt" by the separate bolting of the superheater pipe flangers to the header, and its need did not develop to any great extent in the earlier engines with the "Schenectady," although later experience would suggest its necessity, as more or less trouble is developing with the joints between the superheater pipe and main headers.

Both the second and third requirements are also partially met by the "Schmidt," but not as thoroughly as in the "C. P. R." design, and in both respects the "Schenectady" is deficient. It must not be understood that either of these types give especial trouble in service or are difficult to maintain, in fact, the reverse is the case, but the points mentioned are conveniences and advantages which are believed to have been obtained by the modification illustrated and their value will be appreciated from the roundhouse point of view.

The most important question in connection with superheaters is naturally that of the coal economy obtained, and this is not easily determined, as all who have followed the effect of different improvements or proportions of locomotives will appreciate. Tests are open to the objection that they do not represent general service conditions and coal records on account of their inaccuracy and lack of definite results. Tests on superheaters present, however, an additional difficulty over those directed to ascertain the relative economy of simple versus compound engines, or of wide versus narrow fireboxes, where the efficiency of either the boiler or engines alone is involved, in that they must necessarily include the efficiency of the machine as a whole. The determination of the water consumption per unit of work is not sufficient, as it is quite possible for any advantage shown in this respect to be neutralized by less efficient boiler performance. Even with equal boiler efficiency, the additional heat in the superheated steam would represent a reduction in the water evaporated of one-twentieth of 1 per cent. for each degree of superheat, or 5 per cent. for 100 deg. and 10 per cent. for 200 deg. superheat. In other words, if an engine with 100 deg. superheat showed a saving in water consumption of 5 per cent., in comparison with an ordinary engine, and the boiler were equally efficient, there would be a saving in coal, and there must in addition also be some loss in boiler efficiency on account of the necessarily higher temperature of at least a portion of the smoke-box with any design of superheater.

It is, therefore, necessary in comparing superheaters with other engines to measure the coal consumption per unit of work. To do this a rather extensive series of tests are required to average the influence of the efficiency of the firing with a dynamometer car to measure the work done, and owing to the latter not having been available during the past year it has been impossible to undertake them. During the past winter a car has been constructed which will enable some experiments to be made, but at present the only figures available are those showing the tons hauled and coal consumed on the various sections of the road, and as these after all are the final arbiters of economical working they afford so far as they are susceptible of proper comparison, the most satisfactory evidence that can be obtained. Such figures are not of great value when applied to individual engines, but when obtained from a number of engines, without specially selected crews, working together in regular service they must certainly be regarded as reliable.

The two general classes of superheaters, consolidations and 10-wheel freight engines can only, on the Canadian Pacific, be compared with compound engines as there are no simple freight engines in use on that road at all similar in size or design. Com-

pounding has during the past few years become firmly established for freight service, and on account of the high cost of coal there would be no question as to its continuance had not the use of superheaters been introduced. Of compound engines there are, however, two classes which afford excellent comparisons; the 1,200 class consolidation, of which there are 41 in use, and the 1,300 class 10-wheelers, of which there are 37. Both these classes are modern "Schenectady" compound engines, and although the 1,200 class is rather lighter than the 1,600, it has the same grate area and is a good engine for comparative purposes, while the 1,300 class is practically identical with the 700 class, with the exception of the change from compound to simple superheaters.

The dimensions of the various classes are given in the following table.

	Class				
	1,200	1,300	1,600	1,621	700, 710 & 740.
Boiler pressure, lbs.	200	200	200	200	200
Firebox, width, inside, ins.	65⅜	70¼	65¼	65¼	69⅞
Firebox, length, inside, ins.	96	102⅛	96⅞	102¼	..
No. of ordinary tubes	281	378	244	255	244
Diameter of ordinary tubes	2-in.	2-in.	2-in.	2-in.	2-in.
No. of special tubes	..	..	22	55	22
Diameter of special tubes	..	..	5-in.	3-in.	5-in.
Length of tubes	14′ 2″	14′ 6¹⁵/₁₆″	14′ 1⅜″	14′ 2⅜″	14′ 2⅞″
No. of superheater pipes	..	..	88	88	88
Diameter superheater pipes	..	..	1¼-in.	1¼-in.	1¼-in.
Heating surface tubes, sq. ft.	2,084	2,885	2,216	2,705	2,233
Heating surface firebox, sq. ft.	134	180	165	165	180
Heating surface total, sq. ft.	2,218	3,065	2,381	2,870	2,413
Superheating surface	..	..	375	340	378
Grate area, sq. ft.	43.6	50.0	43.6	43.6	50
Cylinders, ins.	22x35	22x35	21x28	21x28	21x28
Driving wheels, ins.	57	63	57	57	63
Total weight of engine, lbs.	159,500	190,000	186,200	186,200	190,000
Weight on drivers, lbs.	140,500	142,000	163,700	163,700	141,000
Weight of tender	114,000	122,000	121,500	121,500	122,700
Water, imperial gals.	5,000	5,000	5,000	5,000	5,000
Coal, tons.	10	10	10	10	10

In comparing road coal records a good many difficulties are met with, some of which are usual on all roads, while others apply particularly to the Canadian Pacific Railway. The easiest figures to arrive at, those based on general averages, are not by any means reliable, and considerable study is necessary to ascertain the actual result. The consumption per 1,000 equivalent gross ton-miles, or as it may preferably be called per unit miles varies considerably on different sections on account of the difference in profile, the consumption on the same section varies with the weather conditions, increasing from 25 per cent. to 50 per cent. in winter over that required in summer; and also varies under the same weather conditions with the proportion between east and westbound traffic. Engines are on account of the peculiar traffic conditions moved from one section to another more than is usual on most roads. Most engines have assigned crews and in consequence those engines doing the greatest amount of work on any section as a rule give better relative results than those making fewer trips, as the latter are extra crewed and the men are not so interested with the results. Taking these points into consideration it will be found that the records of the summer work afford the most reliable results. According to these, and using the 1,200 compound consolidation class as a basis, it has been found that the saving effected by the 1,600 class with 375 sq. ft. of superheating surface, varied from 15 to 24 per cent., according to the division on which the engine was run and the amount of work done. On one division, between White River and Schneiber, the consumption on the engine with the superheater was 1 per cent. more than on the compound. The other two classes, namely, the 1,300 class, which was a 10-wheeled compound, and the 1,621 class, a consolidation simple, gave results between the other two.

Assuming these comparisons to be accurate, the superheater locomotive has evidently shown itself to be rather more economical than the compound with the amount of superheat obtained, on the "Schmidt" and "Schenectady B" design, and from the good results obtained from the C. P. R. engines there is every reason to believe that still further economies will be reached. The results from these engines were entirely unexpected as the design was developed from a mechanical standpoint entirely, and they are not by any means easy to explain, except that they must be caused by the steam being heated to a higher temperature than in the "Schmidt" or "Schenectady" engines. Since this was not discovered until December it has been impossible to carry out proper temperature tests, on both types, but one made on one of the 740 class engines would indicate a higher superheat of 40 deg. In view of the superheating surface being identical, this can only be explained by the peculiar arrangement of the headers, which prevents any abstraction of heat from the steam, after it has been superheated, by the entering steam, by the tendency to a more equal flow of the steam through the various superheater pipes in passing from one header to another. In support of the first reason the poor results obtained from the "Schenectady" A type are of interest. With 340 sq. ft. of superheating surface against 375 in the "Schmidt" engine, the superheat was only about 20 deg. as against 100 deg. This would show that any reduction in the temperature of the superheated steam by transferring its heat to the entering saturated steam is not as might be expected compensated for, and that the degree of superheat finally obtained may be seriously diminished by such action. The reason for this is not very clear, but a key to it may be found in the following diagrams which have been worked out on the following data:

(a) Firebox temperature 2,000 deg., smoke-box temperature 800 deg., flue 16 ft. long (at point I. from firebox) = 2,000 — 200 nl.

(b) Radiation from superheater tubes equal to that from blackened copper in vacuo = .0854 B.t.u. per min., per square foot per deg. F.

(c) Boiler with 88 superheater pipes 1¼ in. O. D. 12 ft. long using 20,000 lbs. steam per hour with 150 deg. superheat without abstraction of heat after superheating.

(d) Specific heat of superheated steam 0.6.

The full lines show the temperature of the superheated steam on its passage from the header through the tubes and back and the dotted lines the increment of temperature per ft. (Fig. 10) shows the form of these curves when the steam enters the tubes at boiler temperature, and Fig. 11 where its temperature has been raised 100 deg. by contact with the superheated steam, which in its turn is lowered 100 deg. by this action.

It will be seen that there is a loss of 50 deg. by the transfer of heat on account of the increased radiation from the superheater pipes to the boiler and the decreased transmission of heat from the flue gases to the superheater tubes.

These diagrams are not presented with the idea that they are quantatively accurate but to illustrate the actions which accounts for the loss when heat is transferred from the superheated to the saturated steam.

The results obtained from engine 820 in passenger service have been very encouraging as have also those from the Pacific type. A graphic record of a test made on No. 820 shows that the superheat obtained varies from 160 deg. to 200 deg. at the steam chest. This engine has been in service since last June on the Lake Superior division between Chalk River and North Bay, and the results for five months, June to October inclusive, compared to those obtained from two other identical engines on the same section were as follows:

	Tons. consumed.	Lbs. coal per gross ton-mile.	Relative consumption.
Engine No. 823	763	160.0	111.5
Engine No. 820	734	143.5	100.0
Engine No. 838	913	199.0	138.5

There is a difference in the runs in which these engines are employed, all making three stops, but engine 820 having 11 flag stops against two for the other engines, which would, of course, increase the relative consumption of 820 so that while unsatisfactory on account of these figures referring to one engine there is still but little doubt that the superheater is very satisfactory and economical in passenger service, and its relative economy does not decrease with increase of speed as is the case with compounds. The repair question is so far unimportant and nothing has developed to show that superheater engines will exceed appreciably simple engines when expenses that are fairly due to experimental construction are excluded. Lubrication on a superheater is identical with that in a simple, with the exception of the additional cylinder connection required, and what is wanted is simply to deliver the oil to the required spot.

In conclusion the writer sees no reason to change the opinion previously arrived at that the superheater steam locomotive attains equal or greater economy than the compound without any of its disadvantages, and would now add to this by stating that the employment of higher temperatures with the still further economy is relatively practical and to that on engines now under construction the proportions of superheating surface will be increased to attain this result. It is especially advantageous in passenger service and so far no counter balancing disadvantages have been developed which are worth considering. Whether this is due to special conditions on the Canadian Pacific Railway or not superheating is certainly successful on this road, and there is so far no inclination to discontinue it.

DISCUSSION.

It was prominently set forth early in the discussion that the simple locomotive is especially adapted to the use of superheated steam. It has been found that where the engine is complicated by multiple cylinders, condensers or other auxiliary apparatus the saving effected by the use of superheated steam is not as great as in the case of what may be called primitive engines. In fact, while the saving may well drop to 5 per cent. in the former it may rise to 30 per cent. in the latter class.

Yet, while the engine itself is well adapted to the use of superheated steam, it is difficult to design an apparatus to do the work on account of the form of boiler that is in universal use. The difficulties that may arise due to the elimination of a certain amount of the heating surface is of no account and may be disregarded. It is the space and form that gives the trouble.

In reality the steam generator should be a three-stage affair

and should consist of the boiler, the superheater and the economizer. The latter utilizes the waste gases at their lowest temperature to heat the water at its lowest. The superheater uses the hot furnace gases as they escape to add heat to the steam, and it is thus protected from the intense heat of the firebox. The boiler is constructed to withstand the high temperatures of the gases immediately after and during the process of combustion and thus convert the water into steam.

A superheater has the peculiarity that it is always economical, which may not be the case with other auxiliary apparatus; the condenser, for example. There are cases where a condenser not only may effect no saving but may even be the cause of an increased water consumption, but this is never the case with a superheater.

Another advantage of introducing the superheater lies in the fact that the pressure can be reduced on old boilers and the same amount of work obtained as before. In fact, where the superheater has been introduced there is a tendency to lower the boiler pressure. On some new engines for the Canadian Pacific the pressure will be 175 lbs. instead of 200 lbs. on similar engines. The cylinders will be slightly larger, and it is expected that the superheated steam will do as much work and more economically at this lower pressure than the higher pressure on the other engines. Should this expectation not be realized, the cylinders will be bushed and the pressure raised to 200 lbs., as the boilers will be strong enough to carry it.

An important matter to be borne in mind in the designing of a superheater is the means employed for the regulation of the gases, for it is upon this that the efficiency of the apparatus largely depends. Another point is the desirability of securing a uniform flow of steam through all parts of the superheater, and this, it is thought, is accomplished to a marked degree in the C. P. R. design; a fact that accounts to a great extent for its very satisfactory efficiency.

There was some criticism of the results given in the main paper in that the coal records were probably inaccurate, as they are upon most roads, and to this was added a criticism of the heating surfaces given, in that the flat areas of the receivers were omitted, which increased that of the C. P. R. type very materially, and did not greatly affect the others. The speaker, however, rather weakened his criticism of Mr. Vaughan's percentages in that he ended by giving the savings that had been effected on the Belgian roads. These engines using the superheater had saved 30 per cent. in water; 24 per cent. in coal, and hauled an increase of 6 per cent. in tonnage as compared with a four-cylinder compound of the same calculated tractive power. In Sweden, again, a simple engine with a superheater had saved 26.7 per cent. in coal as compared with another simple engine of the same design.

These results have been obtained only by a persistent trial, for five years ago the prospects of success with the superheater were most discouraging in Germany.

As for the amount of superheat, it was considered useless to raise the temperature beyond a point where cylinder condensation is prevented, and 200 deg. Fahr. will do this. With such an amount of superheat the pressure can be reduced from 30 to 50 lbs. This is a matter that should receive most careful attention, since there is no doubt that in the struggle for savings with the compound engine the pressures have been carried too high, and the result has been excessive boiler repairs.

While there is some doubt still as to the effect of compounding on engine repairs, there seems to be none that the introduction of a superheater does cut down boiler repairs, and so it was urged that this alone was reason enough for proceeding rapidly with the introduction of superheaters on locomotives, for they certainly add to the capacity.

It was urged that the value of the superheater depends largely upon the cost of coal, and that where this was expensive, the apparatus was good to use, but where fuel was very cheap it would not be worth while to make the application. The reply to this was that unless the price of coal was less than a dollar a ton the saving of 15 per cent. that could well be depended upon fully justified the extra expense.

One of the principle points to be considered in the superheater is its value to the fireman, who appreciates it most if it relieves him when he is called upon to work the hardest. It was, therefore, claimed by one speaker that inasmuch as fully 20 per cent. of the fuel used was burned when the engine was standing and the superheater of no use, that the real efficiency of the latter would not amount to more than 5 per cent.

On the Chicago, Rock Island & Pacific there are six locomotives with the Cole superheater, but the results obtained have not been altogether satisfactory. The Illinois coal that has been used contains quite an amount of iron, and this forms hard pieces on the ends of the tubes that clogs them and is very difficult to remove. This accumulation takes place so rapidly that it sometimes fills them on a single trip. For this reason the trial has not been altogether satisfactory, though, in spite of the trouble thus experienced, very fine results have been obtained, and with a coal that leaves no deposits the other troubles that have arisen can probably be cleared away in time.

In lubrication a number of experiments have been tried with a positive feed, the results of which have not been very satisfactory. This was partly due to the mechanism used and partly to a misunderstanding of what was required. As a consequence of the experience thus obtained, there has been a reversion to the sight feed lubricator and two connections, one to the cylinder and one to the steam chest, for it is essential that the oil should be delivered to the point where it is to be used. It is now proposed to use a five-section lubricator.

The figure of .60 for the specific heat of the steam was criticized as being higher than the generally accepted .48. The reason given for this choice was that the specific heat varies with the temperature rising from .48 to .75, and that .60 is a fair average between the two. When the cut-off is long the amount of superheat is low, and *vice versa*.

Finally, in the consideration of the various types of superheaters, it should be remembered that Herr Schmidt is not the pioneer in the introduction of the superheater, but of high superheat, an end that is not needed, as already shown. Neither is it desirable or necessary to resort to a special construction of engine, as advocated by Herr Garbe. This engineer suggests the use of cylinders of such dimensions that a uniform cut-off at one-third stroke can be obtained, and that the speed be regulated by the throttle. It is hardly necessary to call attention to the inadvisability of imposing such a condition on American locomotives. The over-cylindering would be such that they would spin themselves to pieces. It is far better to disregard any such suggestions as this and so design the engines that the proportions of cylinders and weights on the driving wheels are such that they will always keep their feet.

Electric Traction for Trunk Lines.

(Concluded from page 416.)

Voltage on Contact Line.

Engineers of the Allgemeine Electric Co., as well as those of the General Electric and Westinghouse companies, have expressed their opinion that 3,000 volts is not sufficiently high. Mr. Lamme is of the opinion that 10,000 volts may not be sufficient and that 15,000 may have to be adopted.

The idea of increasing the pressure in the contact line is justified with the single-phase systems, because with single phase current a pressure of 3,000 volts only permits taking from the contact line one-half the power which can be taken from two contact lines with three-phase current. Then, too, the single-phase system uses a transformer on the car which permits higher pressure without serious decrease of efficiency. Furthermore, the increase in contact line pressure will obviate the use of double transformation in comparatively short lines which will feed directly from the central station. The omission of transformer sub-stations has however disadvantages. It is impossible to choose the pressure at the power stations so that it will suit each particular case. Even if the pressure in the contact line is chosen at 10,000 to 15,000 volts there may be cases where the location of the powerhouse is determined by outside conditions (water power, etc.), which may make necessary higher pressure, say 30,000 or 40,000 volts.

Then, too, it would not appear permissible to have very long sections which cannot be switched out electrically, and in cases of very high contact line pressures this will make necessary separate transmission lines. It would therefore appear preferable to have the transformers between the transmission and contact line rather than on the locomotive in order to choose the pressure for the transmission line as will best suit the particular instance.

There are also other points which speak against having the transformer on the locomotive. First of all this would increase the weight of the locomotive, not only by the transformer's own weight but also by the difference in weight of the parts which have to carry the transformer. Second, the high tension winding of the transformer cannot as well be protected against vibration.

With 3,000-volt three-phase current two normal contact wires each of about 80 square millimeters cross section (two-fifths of an inch in diameter), a contact device such as we use on the Valtellina line will collect from 1,500 to 1,800 h.p., which is quite sufficient for all European railroads. Should we care to double this pressure the capacity of the motors of our present locomotives would have to be decreased about 20 per cent. This difference in capacity is explained by the greater space reserved for insulation used with the higher pressure, which leaves less space for copper.

Altogether I see no reason for increasing the safe and well tried pressure of 3,000 volts which we have thus far been using for all of our European projects.

Power of Locomotives.

The data which I have collected in my trip has substantiated

my former opinion that with a given maximum pressure per axle and with a given number of axles a three-phase locomotive will have double the capacity of the present single-phase systems. The motor of the Hamburg-Altona line, which I have had occasion to see, due to the courtesy of the A. E. G., has a rated hourly output (75 deg. C. temperature rise with ventilation) of 115 h.p. at 600 revolutions per minute, and it weighs 2,350 kgs. (about 5,170 lbs.). Three of these motors use one reducing and regulating transformer which weighs 2,500 kgs. (about 5,500 lbs.). Our Canada motors, which can be used on three-phase as well as on continuous current have an hourly rating of 120 h.p., and one of these weighs 1,750 kgs. (about 3,850 lbs.). If the motor were built simply for three-phase current the weight would be 1,300 kgs. (about 2,860 lbs.), inasmuch as these motors do not need any transformers, but have a starting rheostat which per motor does not weigh over 200 to 300 kgs. (440 to 660 lbs.). It is evident that one horse-power capacity weighs, for three-phase, about 16½ kgs. (about 36.3 lbs.) (for motor and rheostat), and in the Hamburg single-phase about 27⅓ kgs. (about 60.5 lbs.) (for motor and transformer). I have taken the transformer as a specific regulating device, together with the motor, and in the other case the motor and rheostat. In all other parts of the equipment there is no special difference in weight.

Still more favorable for three-phase is the comparison if made with a view to determining what capacity could be had in three-phase motors with the weight of the Hamburg single-phase motor and transformer.

A motor which we designed for the London & Brighton Ry. (Canada) weighs 2,800 kgs. (about 6,150 lbs.), which corresponds to the weight of the Hamburg motor with its transformer weight, and this motor has a rated hourly capacity of 360 h.p., which is three times as much as the Hamburg motors.

Still more interesting and important is the comparison which can be made as regards weight and capacity between heavy locomotives of the two systems.

I have seen a Westinghouse single-phase locomotive weighing 62 American tons, having three axles equipped with three motors of 225 h.p. hourly rating each. The motors had a gear ratio of about 1 to 5. Each single motor weighs approximately 12,000 lbs., and the corresponding reducing and regulating transformer about 15,000 lbs., about 23 metric tons in all. The motor equipment of our new Italian locomotives for three speeds, including water rheostat and water, is about 26.5 metric tons, and has an hourly rating of 1,500 h.p. The three-phase equipment weighs therefore about 17.7 kg. per h.p. (about 38.9 lbs.), and the single-phase equipment 29.3 kgs. (about 64.5 lbs.), and it must be remarked that the motors for the three-phase locomotives work without any gear, while the motors for the single-phase locomotives have a very high gear reduction, so that the latter have about five times the number of revolutions at the same schedule speed as the three-phase motors. In addition to that, the output of 1,500 h.p. of the three-phase locomotives is obtained by the use of only one of the motors on each locomotive.

Had we built this three-phase locomotive for one single synchronous speed, the weight of the motor and rheostat would have been 14,800 kgs. (about 32,500 lbs.) for 1,500 h.p., or about one-third of the weight of the above mentioned single-phase locomotive. Both locomotives have about the same diameter of driving wheels. The additional weight of 6 tons over the three-phase locomotive (this locomotive weighs about 62 metric tons) is the result of two special pilot axles. The maximum drawbar pull of both locomotives is the same (25,000 lbs. for the single-phase locomotive, and 11,500 kgs. for the three-phase locomotive). This drawbar pull can be developed for the three-phase locomotives up to 25 km. (about 16 miles) per hour with the new locomotive of three different speeds, and up to 32 km. per hour (about 20 miles) per hour with the small locomotive for two different speeds. The single-phase locomotive has only 10 miles per hour, or about one-half the speed, when it develops this drawbar pull. The maximum speed corresponding to the maximum safe number of revolutions of the motors is about 30 miles per hour. The three-phase locomotives, however, can develop their full capacity at 64 km. (about 40 miles) per hour, or at a speed one-third higher than the single-phase locomotive.

My data with reference to the New York, New Haven & Hartford locomotive is not complete, but what I have is sufficient to compare a high-speed single-phase locomotive with a direct current locomotive or with our three-phase locomotive. The New York, New Haven & Hartford locomotive has four motors of 250 h.p. the three-phase locomotives work without gear transmission, while the motors for the single-phase equipment have a very high gear each, and each of these motors weighs about 14,000 lbs. If we take the corresponding transformer in about the same ratio to the total weight, as we found with the other single-phase locomotive, it will weigh about 22,000 lbs., and motor and transformer together about 78,000 lbs., or 35.5 metric tons, which corresponds to 35.5 kg. per h.p. or almost exactly double the weight of that of the motor and rheostat in our Italian locomotives. The single-phase motors of the A. E. G., as well as the Westinghouse company, represent a result of several years' study, and are to-day already in such a state of perfection that future improvements will hardly be able to offset the advantages of the three-phase locomotives.

Full Use of Weight and Adhesion.

This is one of the most important problems, and in order to obtain the maximum drawbar pull with a given weight of adhesion four main conditions have to be fulfilled. First, motors must give as constant a pull as possible; second, the drawbar pull must be regulated as slowly as possible, and the steps must be as numerous as possible; third, the distribution of the drawbar pull on the driving axles must be proportionate to the pressure on axles; fourth, the motors must be capable while standing still to develop the full torque for a certain time without injury.

Continuous current and polyphase induction motors have practically an almost constant torque. Single-phase commutator motors, however, have a torque varying between zero and the maximum, if no special devices are employed. In the latter case about 0.7 times the torque of continuous current or three-phase motors can be obtained.

The above mentioned single-phase locomotive of the Westinghouse company demonstrated that with 25 cycles per second it is sufficient to have a spring suspension for the motor in order to ameliorate this condition. As a matter of fact, I have been told by engineers of the Westinghouse company that this locomotive will surely give one-fifth of its adhesion weight as drawbar pull.

With direct connection motors it will be necessary to have either an elastic coupling between the motor and driving axle or an elastic suspension for the motor casing, which will allow an oscillation of the casing around the axle.

I have been informed that with the New York Central locomotives it was necessary to reduce the drawbar pull, which was originally stated at 20 per cent. of the adhesion weight to 15 per cent. Whether this was caused by the difference in pressure of the axles or by the difference in torque of the motors or by the few steps of the controller, I could not find out. In any case, the coupling rod and the water rheostat used on the Italian locomotives are an ideal solution.

A few words with reference to the fourth condition regarding our adhesion weight in cases where a heavy train is hauled on a heavy grade, that is when the locomotive works near the limit of its adhesion weight and where this locomotive must be stopped, as is the case on all of our European railroads going through mountainous countries where we have heavy gradients immediately in front of stations. It is necessary that the locomotive must give its full drawbar pull standing still for a certain time, inasmuch as the brakes cannot be opened before the locomotive has developed its entire pull.

A continuous current or a three-phase motor can give its full torque standing still, for some time without injury. Not so the single-phase motor, where the coil which is short circuited will have a heavy current. The temperature of this coil will soon rise so as to destroy it.

In the Westinghouse motor there are metallic resistances inverted between commutator and armature windings, and these resistances would be fused by the short circuiting current. An increase of the size of these resistances would increase the temperature capacity, and thus the time which the motor can be placed under torque while standing still could be increased also. But this is not a radical solution of the question, not any more than the incandescence of the brushes in the Eichberg motor, because even an increase from 10 to 30 seconds would not give any really satisfactory length of time.

Making Up Lost Time.

It has often been called a disadvantage of the three-phase system that it would not be able to make up delays. The possibility of making up time is not so much a question of the system but rather one of the schedule or time-table. The change of time which is necessary to make a given distance is given with each system, and it is a matter of adjustment in time-tables to decide what difference in time will be allowed between schedule time and the shortest possible time which will be reserved for making up delays.

With a continuous current system more than with the three-phase system, economy will be poorer if the schedule time is so adjusted as to leave too much of a reserve for deviation from the time-table. With the single-phase system a change of ratio of transformation will increase the speed and therefore reduce the minimum time, and the limit in this case is only given by the maximum speed which can safely be allowed for the motors; but it is not influenced by any regard to economy.

This is an advantage of the single-phase system over continuous current and three-phase systems, and may be important in cases where trains are despatched without fixed time-table, for instance in suburban rapid transit systems, in such cases especially during rush hours a delayed train will interfere with all trains following it, and it is therefore necessary to make up even small delays as much as possible. In such cases it is permissible to raise the aver-

age speed of all trains proportionately. This could only be done with continuous current and three-phase current if the entire system were projected for a higher average speed than the normal speed which, as stated above, would affect the economy. With single-phase current, however, a few additional taps on the transformer will give a reserve higher speed without badly influencing the economy at normal speed.

For trunk lines with comparatively long distances between stations this advantage of the single-phase system must not be overestimated, inasmuch as trunk lines have no such special demands for making up time under all circumstances. The present steam roads have a time-table very near the limit of the capacity of the steam locomotives, and there is only a comparatively small reserve time which can be made up. With the three-phase system, as we use it on the Valtelina line, it was easy to create a similar reserve without influencing the economy of the normal schedule runs. The special advantage of the three-phase system in this case was that this time reserve was always at the disposal of the engineer, inasmuch as three-phase motors are not in any way influenced in their speed by overloads, strong counter winds or extra heavy trains, while with steam locomotives and with continuous current locomotives similar overloads will usually occur at the same time as delays and therefore tend to decrease the speed and to augment the delay.

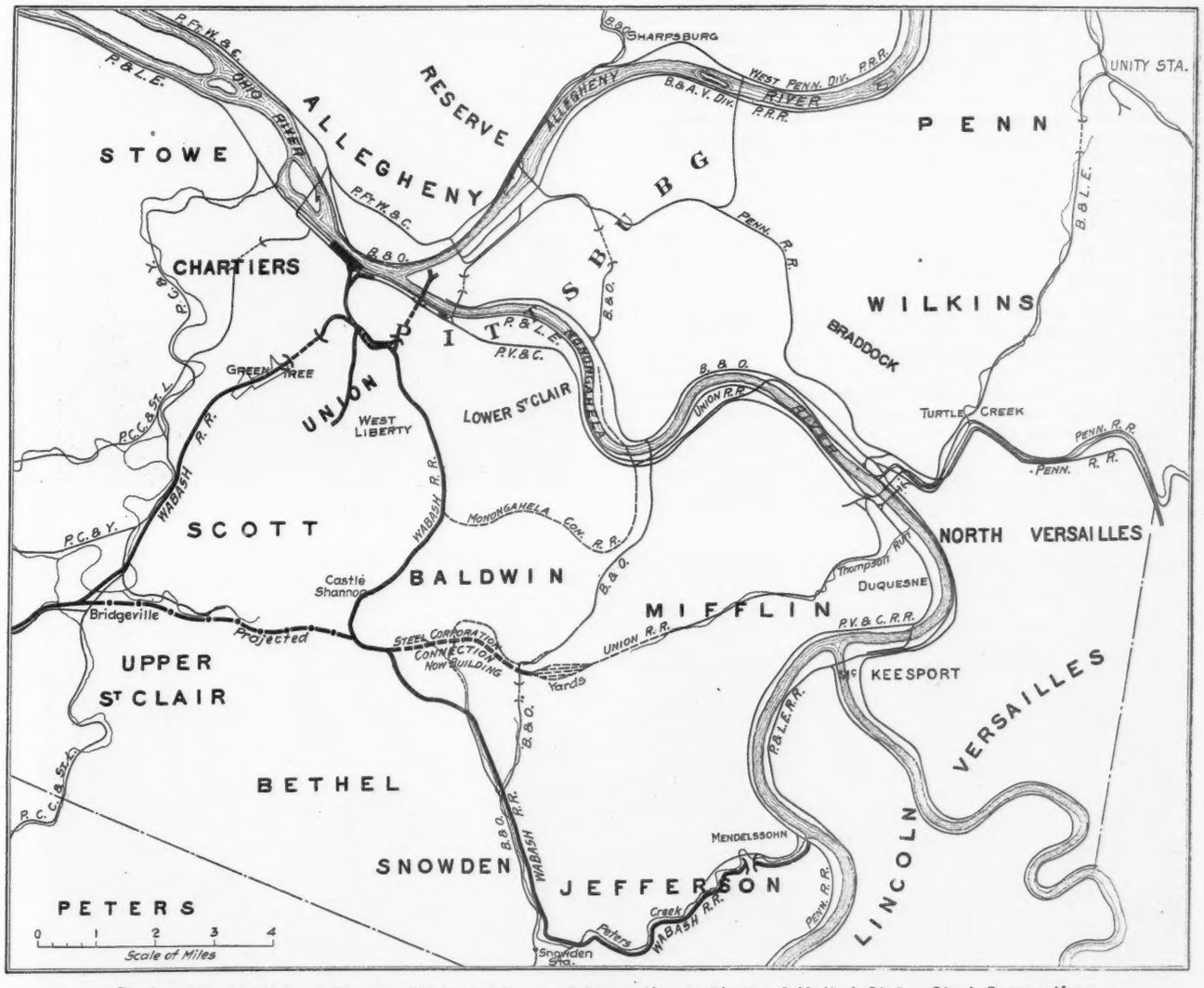
Energy Consumption.

It was my purpose to compile the data which I received during my trip, and I have therefore not given a complete criticism of the various systems. I mention, however, one of the most important points for comparison, which is the energy consumption. The scientific treatise of Mr. Frank Waterman, which he read before the Asheville convention of the American Institute of Electrical Engineers, makes detailed discussions by myself unnecessary at this time. Mr. Waterman based his paper on calculations and experiments made by him on the Valtellina line, and he proves that the three-phase system is the most economical of all known systems for the various traction problems.

Wabash Eastern Improvements.

WABASH-PITTSBURG TERMINAL.

The first efforts of the Wabash management in the Pittsburg district were taken up with the serious problem of effecting an entrance into the city. The accomplishment of this plan, after it was made feasible by the requisite legislation and permission of the Federal Government for the necessary bridge over the Monongahela river, has been followed by the development of facilities within the city of Pittsburg. Through the courtesy of Mr. B. A. Worthington, First Vice-President and General Manager of the Wabash-Pittsburg Terminal and the Wheeling & Lake Erie, we are enabled to review the various improvements under way on these two lines.



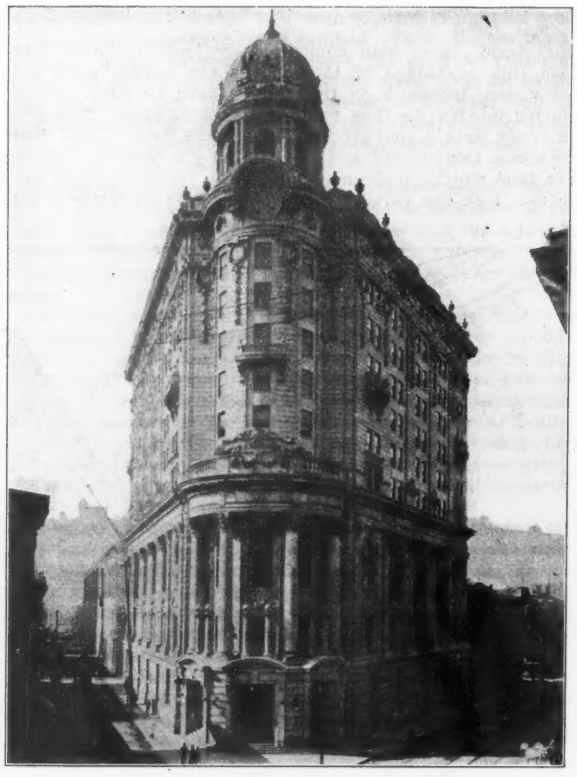
Region About Pittsburg Showing Wabash Lines and Connection to Plants of United States Steel Corporation.

The accompanying maps show the general situation of the railroad lines about Pittsburg and the district in which the Wabash freight and passenger terminals are situated. The photographs include the passenger station and office building and the new freight station recently opened. The freight station, it will be seen, is a four-story building with the tracks on the top story, transfers from the track level to the street being made by elevators. It is 145 ft. wide by 572 ft. long and covers the city blocks from First avenue to Fourth avenue, lying between Redoubt alley and the passenger terminal. The main buildings are of steel and concrete construction and enclose a total floor space of 134,000 sq. ft. A drawing showing a cross section at two points of the freight station is shown herewith. There are five modern high-pressure plunger elevators of extra large size and capacity which furnish

rapid and convenient means of communication between different floors of the station. Of the four floors, the two intermediate ones are chiefly used for storage and as a means of communication with warerooms, 22 of which are now being built for the use of commission merchants and for other purposes, thereby avoiding storage and rehandling in the freight station. They face on Ferry street and Fourth avenue underneath the passenger terminal. On the ground floor of the freight station 40 extra large doors aid in quick handling of freight. The freight terminals are in the heart of the business section of Pittsburg, the main entrance facing Fourth and Liberty avenues, the latter of which is the principal teaming thoroughfore of the city. A great point of economy in the operation of the station will be the handling of freight from cars to trucks, running trucks on elevators, and lowering to wagons or into the warerooms. A power plant for electric light, steam heat and refrigeration is now being built. This is to supply the terminal office building, passenger station, freight station and warerooms. There will be two 50-ton refrigerating machines. The four tracks of the freight terminal will hold 10 cars each, and can be loaded simultaneously. There are also tracks for storage and shifting. In the passenger station there are seven tracks. Baggage and express matter is handled on the floor below the track level.

About a mile from the terminal station and within the city of Pittsburg there was originally a small tunnel 400 ft. long known as the Bigham tunnel. This has recently after about two months work been converted into a cut, material from the excavation being used for filling in additional ground at the two yards in the terminal territory—the West Liberty yard and the Rook yard. The West Liberty yard is used entirely for weighing and classifying coal by gravity tracks. The Rook yard is a much larger yard with repair shops, and is about four miles southwest of the terminal station. Further west, the numerous tunnels are being lined and a large wooden trestle approaching the cantilever bridge over the Ohio river at Mingo is being filled in. At Hickory, Smithfield and Young new stations are being built, and it is planned to build a new station also at Virginia, near the east bank of the Ohio river.

At the time when the Wabash was trying to get an entrance into Pittsburg an agreement was made with Mr. Andrew Carnegie by which the Wabash line was to be given one-quarter of the in- and outbound tonnage of the Carnegie works. Soon after, the Carnegie Company was absorbed by the United States Steel Corporation and there was some doubt as to the legal responsibility of the larger corporation for carrying out this agreement. This, however, appears to have been settled satisfactorily, for the Wabash-Pittsburg Terminal is now building a four-mile line from the track of the West Side Belt Railway, a controlled local switching road, at a point one mile east of Castle Shannon to the head waters of Thomp-

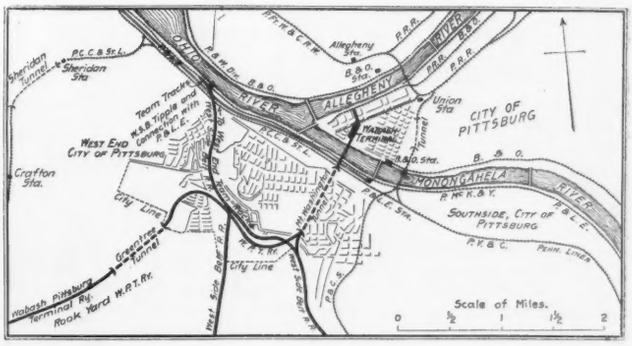


Wabash Passenger Station at Pittsburg.

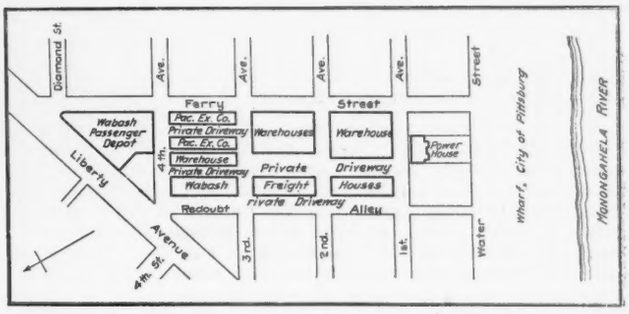
Wabash Freight Terminal at Pittsburg; Looking North Toward Passenger Station.

son's Run, where a 2,000-car yard is being built at the junction of this new line with the Monongahela Southern Railroad, a subsidiary company of the United States Steel Corporation. The Monongahela Southern is seven miles long and extends to a connection on the Monongahela river at Duquesne with the Union Railroad of the United States Steel Corporation. The railroad map of the Pittsburg territory published herewith shows this new Wabash connecting line. Completion of the four-mile gap will make a connection between the Wabash line and the principal plants of the United States Steel Corporation. Large yard facilities are being provided in contemplation of the great volume of business to be received from the Steel Corporation. The Homestead, Bessemer and Braddock mills of the Steel Corporation, the works of the Westinghouse Electric & Manufacturing Company and the Westinghouse Air-Brake Company will be reached. The Steel Corporation's mills at McKeesport are also to be brought into connection by build-

Wabash Freight Terminal at Pittsburg; Looking South Toward the Monongahela River.



Map of Terminals in Pittsburg—Wabash-Pittsburg Terminal and West Side Belt.



Vicinity of Wabash Terminal in Pittsburg.

Wabash Freight Terminal at Pittsburg Looking South Toward Monongahela River.

ing a short connection. The following statement shows the large amount of traffic of the different plants during the year 1905:

	Gross tonnage	
	Outbound.	Inbound.
Carnegie Steel Co.:		
Homestead	2,105,000	4,100,000
Duquesne	1,000,000	4,000,000
Bessemer	1,000,000	4,000,000
American Steel & Wire Co.:		
Braddock	435,000	870,000
American Sheet & Tin Plate Co.:		
Braddock	25,000	50,000
McKeesport	50,000	100,000
National Tube Co.:		
McKeesport	425,000	1,900,000

The new connection is expected to be in operation not later than the middle of May. Its completion and the beginning of shipments by the various plants is expected not only to give a large volume of traffic to the local lines of the Wabash system, but to increase the general traffic of the whole road.

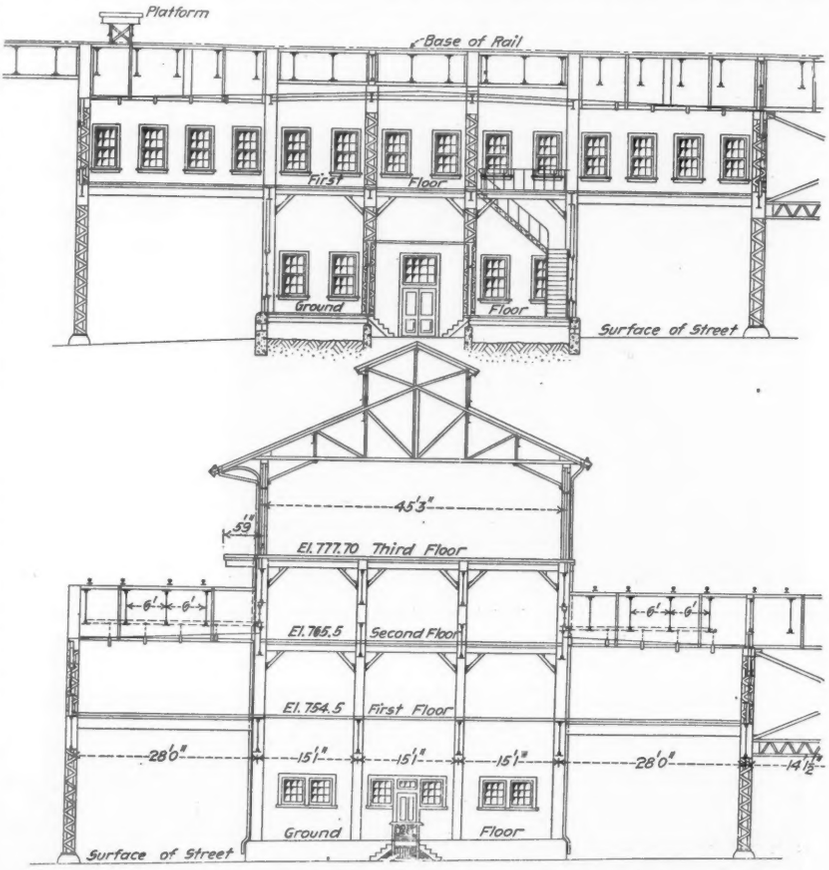
Another connection is being built; this one at Clairton, between the West Side Belt and the St. Clair Terminal Railroad of the United States Steel Corporation. This will make it possible for business from the great Clairton plant to be handled to and over the Wabash lines. The Clairton steel plant is scarcely more than in its construction state, but the tonnage was 375,000 tons outbound and 1,500,000 tons inbound during 1905. The Steel Corporation has made large purchases of land in the vicinity and proposes to enlarge the Clairton plant so that it may be brought up to about the size of the largest plant, that at Homestead.

WHEELING & LAKE ERIE.

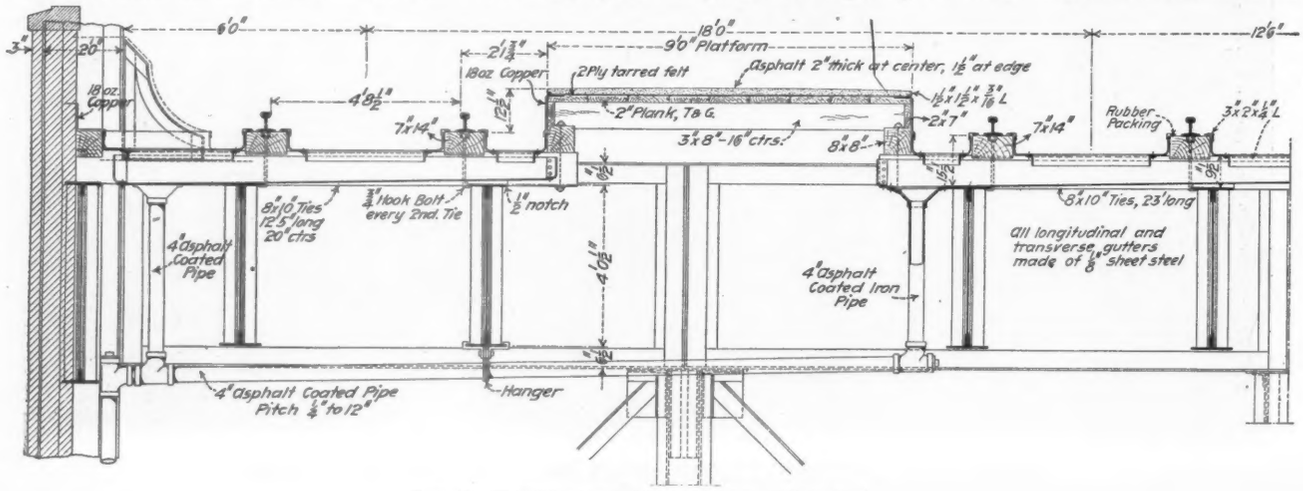
At Jewett, Ohio, the Wabash-Pittsburg Terminal connects with the Wheeling & Lake Erie, the Wabash connection between Toledo and Pittsburg. Between Jewett and Toledo, 185 miles, all 56-lb., 60-lb. and 70-lb. rail is being replaced with standard 90-lb. section, and it is expected to have the whole line relaid with 90-lb. rail by the end of 1906. The lighter rail taken up is used in yard extensions and the 70-lb. rail on the Wheeling and Mingo division, where it replaces 56-lb. rail. Rails for about 40 miles of track are now distributed and are being placed in the Toledo division main track. Ten thousand tons additional 90-lb. rail will be received shortly. A great deal of gravel ballasting is to be done during the present season. Steam shovels have been put at work in the Stringer gravel bank on the Ohio river, the Warrington gravel pit at Warrington, at Coshocton on the Cleveland & Zanesville division, and at Belleville on the Toledo division. At the same time tracks are being relined and all curves relaid with transition ends. Much attention is being paid to increasing the capacity of the Toledo division. Twenty new 80-car passing sidings are being laid and 20 other sidings are being extended so as to hold 80 cars. When these are all built there will be passing sidings at an average interval of about four miles. Many of these are built as "lap" sidings, with the purpose of eventually using them in the double tracking of the road.

The capacity of the Homestead yard, near Toledo, has been increased by about 500 cars during the past year. It is now proposed to build a large yard at South Huron, Ohio, and to increase the track facilities at North Huron in order to take care of the improvements now under way there. The South Huron yard is to be a gravity and classification yard of 1,000 cars capacity. These yard developments will make it necessary to change the position of the main line for about one mile to the eastern boundary of the company's property along the public highway.

At North Huron, Ohio, there is to be installed a more powerful engine to operate the present efficient car-dumper; all the existing ore conveyors are to be rebuilt and reinforced, so that two-ton clam-shell buckets can be used; the track arrangement is to be remodeled; an additional slip 1,400 ft. long, with 20 ft. draft of water and 200 ft. wide, is to be dug; there are to be installed four additional five-ton Wellman-Seaver-Morgan ore conveyors and an additional McMyler car-dumper, all to be provided with suitable track facilities; a 400-ft. ore conveyor bridge to the ore stock pile is to be built, the capacity of which will be about 1,500,000 tons; a complete rope haulage system for handling cars to the ore conveyors and stock piles is to be put in; the streets and other highways are to be changed from their present locations to the southern limits of the yards, and the principal street at the south end of these tracks



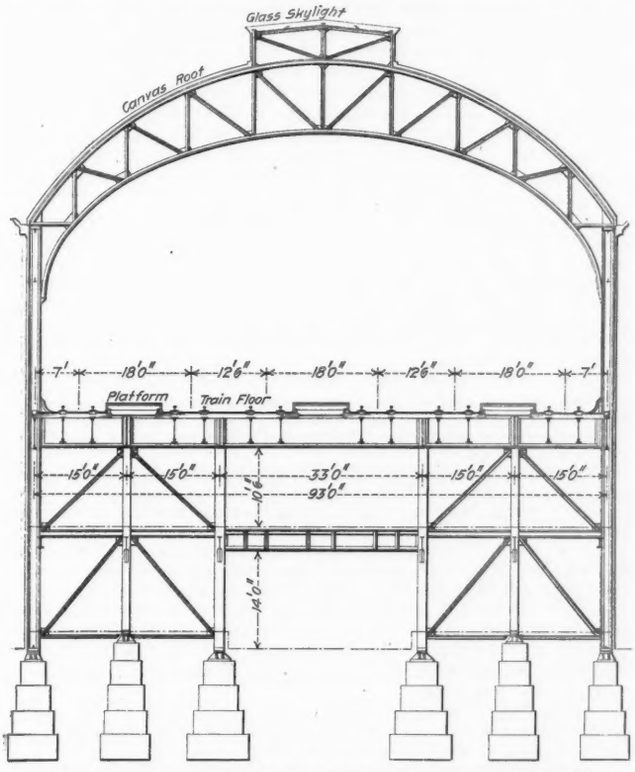
Cross Sections Looking North from First Avenue; Wabash Freight Terminal.



Details of Floor; Wabash Passenger Terminal.

is to be built parallel to the Lake Shore & Michigan Southern tracks across the Huron river and into the town of Huron.

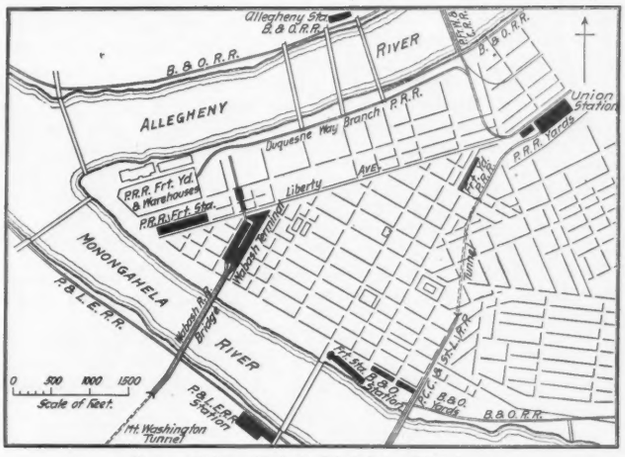
At Cleveland a new lift bridge over the Cuyahoga river has lately been finished and plans are being developed for greatly improving all bridges and track facilities in that city, to accommodate much larger business. Contract has been let for a McMyler car-dumper, which is now under construction. It will be necessary to rebuild about 900 ft. of dock at this location to conform to a change in line of the Cuyahoga river, recently made by the city of Cleveland, and also to build new tracks and increase yard capacity. The city of Cleveland, in conjunction with the Wheeling & Lake Erie, is to do away with another grade crossing at Jefferson street and rebuild several small bridges at other points in this city to accommodate the heavy rolling stock now operated on this division.



General Transverse Section of Wabash Passenger Terminal.

There is also in contemplation the building of a large yard at the summit of the grade four miles south of Cleveland, but final plans have not yet been settled. The yard at Kent, on the Cleveland & Zanesville division, has been doubled in capacity and now holds about 400 cars. A new wye has also been built at this point.

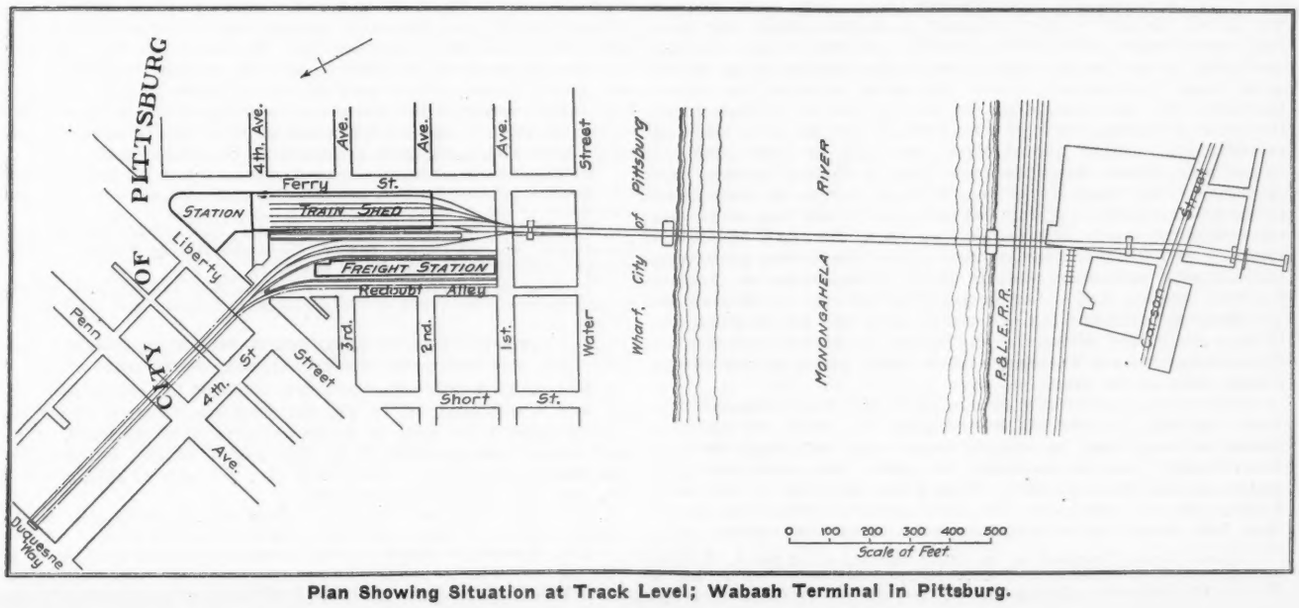
Several grade reductions will be made on the main line of the Wheeling & Lake Erie during the present year, with the purpose of ultimately cutting out all grades on the Pittsburg and Toledo division that exceed four-tenths of 1 per cent. compensated. New freight stations are being designed for Zanesville, Fremont and Dillonvale, and a plan is now under consideration for establishing docking facilities on the Maumee river in the city of Toledo.



Map of the Point District, Pittsburg.

The construction of the Orrville-Bolivar cut-off, known as the Sugar Creek & Northern Railroad, is now under contract. It is to be 22 miles long and will do away with excessive curvature, save six miles in distance and reduce the maximum grade from 1 per cent. uncompensated to four-tenths of 1 per cent. compensated, with 3-deg. maximum curvature. This will make it possible for heavy consolidation engines to haul the maximum train load single-header. Ninety-pound steel rails on white oak cross ties with 12 in. of ballast and steel and stone bridges are to be used, and all through freight trains operated over this cut-off. The new line leaves the present line of the Wheeling & Lake Erie at Bolivar, Ohio, crosses the Zanesville division at Justus and again meets the main line at Orrville. At Justus, the Zanesville division junction point, much ground

Wheeling & Lake Erie.



Plan Showing Situation at Track Level; Wabash Terminal in Pittsburg.

has been acquired, on which a 2,000-car yard is ultimately to be built, with modern roundhouse and shops. The new cut-off is expected to be finished by November 1st, with sufficient yard and shop facilities to meet present requirements.

At Columbia, Ohio, near the junction of the main line and the Cleveland and Zanesville division, the Wheeling & Lake Erie's principal yard is located. Here trains are made up for both the Cleveland and Toledo divisions. The capacity of this yard has been increased during the past year by 200 cars, and to the full limit of possible development. It now covers all the area between the tracks of the Cleveland, Lorain & Wheeling (B. & O.) and the river.

At Canton shop facilities have been increased and modern machinery and appliances installed.

At Terminal Junction, near Wheeling, W. Va., a 200-car yard is now being built and general facilities are being bettered to meet increased business.

The estimated cost of the improvements made and under way on the Wabash-Pittsburg Terminal, West Side Belt and Wheeling & Lake Erie, as furnished us by Mr. Worthington, is shown in the following table:

Passenger station, Pittsburg	$1,500,000.00
Freight terminal, Pittsburg	450,000.00
Warehouses	300,000.00
Power Plant.	100,000.00
Bigham Tunnel cut	30,000.00
Rook Yard	18,000.00
West Liberty Yard	18,000.00
Ballasting	530,000.00
Homestead Yard	100,000.00
North Huron Docks	800,000.00
South Huron Yard	150,000.00
Cleveland Docks.	85,000.00
Yard near Cleveland	60,000.00
Zanesville freight station	15,000.00
Fremont freight station	4,000.00
Dillonvale freight station	4,000.00
Orville-Bollvar Cut-off	820,000.00
Columbia Yard	25,000.00
Canton Shops—increased facilities	75,000.00
Terminal Junction Shops.	10,000.00
Union R. R. connection	186,500.00
Justus Shops	600,000.00
Norwalk Roundhouse	25,000.0
New passing sidings on W. & L. E.	150,000.00
Total	$6,055,000.00

Injuries to Employees Caused by Their Own Carelessness.*

Lastly, I shall call your attention to a few of the accidents in which employees are injured by their own carelessness. thoughtlessness or recklessness, and frequently it is the latter. If we could eliminate them and one-half of those caused by the carelessness of other employees much of the unfavorable criticism of railroads would cease, as the cause would no longer exist.

We will take up some of the most common accidents of this class, caused by coupling cars, getting on or off, or falling from, trains or engines, moving or standing. The following cases will serve to illustrate how frequently unnecessary chances are taken and the result.

Can anyone imagine a reason why a man of common sense who is old enough to be out of school should stand on a footboard and when the couplers are almost together put his hand in between them to pull them over or try to kick them over with his foot; walk backwards between the rails fixing a Jenney to get ready to couple, instead of stopping the car or engine and getting the coupler in position; why they should stand in the middle of the track and wait for an approaching engine or car to reach them and then step onto the footboard or brake-beam, when they could just as well get on the side or other end, and do it with safety; why men jump on an engine pilot, which Rule 761 prohibits, or on a moving car to ride a few feet to a switch, when the same is going so fast as to make it dangerous, unless they want to show how expert they are; why they should get off moving cars or engines under the same circumstances; why a man should not get off a standing car or engine without getting hurt; undertake to climb from car to car when unnecessary; cross the track in front of moving cars or engines, when they are so close to them that to the uninitiated it looks like suicide; or cross between cars, when they could just as well climb over? But rather than take the time, which the company pays for, they take the chances, and then if they get across, like the man who drove over in front of the engine at the last highway crossing and waited on the other side to see the train go by, they wait until the tail end comes along and get on there, but if they get caught blame the engineman for coming too fast, or the company for not having the track nickel plated, or for having a hand hold in the wrong place.

Why they should allow themselves to be struck frequently in broad daylight by overhead obstructions, for which tell-tales are erected to warn them; by building close to the track, with the location of which they are familiar. Yet rather than work their gray matter a little, they get hurt. Why a man sent out to look after broken rails or defects in the track shouldn't watch for trains from both directions or take the trouble to ascertain before starting whether trains are on time. And yet you all know that just such chances are taken every day with results shown in the following cases, which are such as happen all the time; the only reason or excuse that can be given for them, that I can imagine, is, that the men injured never should have been employed; that instead of being employed on trains and engines and drawing—not earning—more pay than principals of schools, and frequently than school superintendents, they should be working in a barn or shoveling dirt instead of on a railroad, where their recklessness, carelessness, and failure to realize the dangers of the business and the necessity of complying with the rules and taking no unnecessary chances, not only endangers their own lives, but those of others. They are of the same class that the railroad organizations, for the protection of their desirable membership, ought to help get out of the service, not try to keep in until someone is seriously injured or killed, and then complain and say the company is liable because they keep such a grossly careless, incompetent man in the service; and if you will think for a minute, you will know that none of the careful, forehanded men—the men who own homes and have a little money in the bank—are in this class; I never saw one of them in my office on such business and never will.

I will first refer you to some cases caused in coupling cars, and by getting on and off cars, of which the following are fair samples, each of which not only could, but should have been avoided by the exercise of a little common sense by the injured person:

G. L. Penston, collector, injured at Wanley, May 10; went in to uncouple hose after getting train onto track; did not tell anyone he was going in between the cars; other cars were switched onto train and his head was caught between the cars.

Henry Kendrick, switchman, injured at Mertonville, March 13; was standing on front footboard of engine, which was about to couple onto a car; drawbar on engine was too far to one side to make the coupling and Kendrick attempted to kick it over with his foot, but missed it and his foot was caught and crushed.

M. T. Bowers, fireman, Fairmill, Jan. 6, was trying to jump from the running board of engine to footboard, when he fell and was injured.

L. B. Gorky, conductor, Panitoca, Aug. 14; was standing on top of car, gave engineer a stop signal, and when slack came back, fell off car.

P. F. Newton, conductor, injured Oct. 3, at Durham; got off head end of train, and tried to get on way-car as it came along, and was thrown to the ground and badly injured. Train was moving about 15 miles an hour.

Then comes the class of injuries caused by crossing between cars or in front of moving cars or engines, and those caused frequently in broad daylight by obstructions with the location of which employees are perfectly familiar, but fail to take any care to avoid, such as the following:

H. M. Tupper, switchman, injured at Murferton, March 21, ran ahead of moving car to throw switch; after throwing the switch he attempted to cross the track again ahead of the car, was struck and badly injured.

David Spurton, switchman, Olivia, Dec. 12; while hanging on side of car, was caught between car and viaduct, and severely injured.

L. Q. Laffiin, switchman, Rutherville, Oct. 4; was sitting on top of car riding backward his head struck viaduct, and he was knocked off and injured.

Among other classes, altogether too frequent, as well as unnecessary, are those caused by leaving cars too near a switch to clear a man on a car on the next track; by going under cars to repair them, or under engines to clean the fires, without putting out a flag; by cutting steam hose without first knowing the steam is turned off.

Now why a man switching cars will not take the trouble to put them far enough in on the track to clear himself riding the next cut in on the adjacent track, or why a man will go under an engine or car to repair it or for any other purpose, without protecting himself from injury by putting out a flag as required by Rule 153, passes my understanding. Whenever you find the rule disregarded, report it, so that it will not happen with the same man in the future; why a man should undertake to cut the steam hose before he knows the steam has been turned off, the devil himself could not tell, and yet the following cases would seem to show that a man with a big stick is needed all over the system.

William Jacobson, switchman, injured at Delavia, May 19; he left caboose on side track too near the lead, and then rode some cars down the lead, and was struck by the caboose.

H. J. Calpine, car repairer, killed at Mestigo, June 3; was under car making repairs; did not put out flag or tell anyone that he was going under the car; the car was moved and he was killed.

J. P. Alton, switchman, injured at Wolton, July 13; cut hose between sleeper and coach and failed to turn steam shut-off cocks; was badly burned by steam.

The number of injuries to bridgemen, carpenters, freight house, dock, coal shed and track men is increasing every year.

And lastly I will refer to a few cases of injuries which cannot well be classified, so we will say from other causes. They are a miscellaneous lot, none of which ought to have happened, or indeed would have happened if the first rule of nature, self-preservation, had been observed. But I will give you several examples and you can then judge for yourselves:

A. F. Ford, barkeman, injured at Lenopa, Sept. 3; hanging on side of stock car instead of ladder, cow kicked him and broke his wrist.

B. L. Pomeroy, brakeman, fatally injured at Schuyler, Oct. 29; in attempting to oil a hot box while train was running, he fell under the wheels.

John Leveridge, fireman, injured at Worthington, May 8; passing through

*From a paper prepared by the Claim Department of the A., B. & C. Railroad, parts of which appeared in the *Railroad Gazette* of Dec. 15, Jan. 5, Feb. 23, and March 2.

town, waved hand at trainmen standing on side track, struck mail crane, and injured his arm.

Richard Manville, switchman, injured at Poulsville, June 17; stood on top of car giving signals and when slack ran out fell off of car; left leg broken.

K. T. Morrison, brakeman, Homerton, April 26; went back along the track, to flag his train, went to sleep on the track was struck and killed by another train.

And so I might go on for hours detailing to you the various accidents that have occurred from the carelessness of employees, but I believe you will agree with me in thinking I have enumerated enough of them to illustrate the point I wish to make; that is, the employee is too careless, thoughtless and negligent; and I hope also to satisfy you that the larger part of them could be avoided and that a united effort should and will be made by us all to prevent them in the future. It does not require any argument to demonstrate that the many accidents occurring every day, and the resulting injuries and destruction of property, ought to be reduced, and that, if the rules were complied with and proper care and supervision exercised in transacting the business of the company, their number and consequent money loss would be materially reduced; and it is up to you men to do your share to bring about this necessary result. A company that advertises that it has the best of everything—including men—that goes to make up a first-class railroad and that has spent not thousands but millions for safety devices and appliances, as the A. B. & C. has, ought to be able to make a better record; indeed, it ought to make the best record and I believe when you understand the matter we will be where we belong—at the head of the procession, not only so far as freedom from accident is concerned, but in everything else.

Blackstone, in his Commentaries on the Common Law of England, said that the great beauty of the common law was that under it "there was no wrong without a remedy," and so I say that there must be some remedy which, if properly applied, would prevent the happening of a large proportion of these casualties; and I suppose that the man who says there is a wrong or criticises results —and I believe I have demonstrated that there is something wrong —ought to be able to at least suggest some remedy which will sound plausible, even if it is not practicable.

In addition to the suggestions which I have made in discussing the different classes of accidents herein mentioned, there are several others which, in a general way, I submit to you and to the management of the company.

One of the most, if not the most, necessary things in securing good results and as few casualties as possible is to hire good, competent, careful and sober men to do the work, and when we have a bureau of employment properly conducted to secure the best men and a school in which to instruct them as to what the rules under which the road is operated are, what their duties are, and how to perform them, in conjunction with the physical examination of applicants for employment, we will have taken the most important step to do away with accidents and when we clear our roundhouses, repair yards, coal stations, gate houses and all other branches of the service connected with the transportation of persons and property of men with whom neither other employees nor the public can communicate because of their inability to understand or talk the English language, we will have taken the next one.

When labor organizations and employees generally do what they can to keep incompetent, careless men out of the service, not in it, and when they are discovered in some careless act, or cause some accident, and are discharged or suspended, instead of trying, through the influence and power of their organization, to have the discharge or suspension set aside, do all they can to sustain the order of suspension or discharge, we will not have the list of casualties staring us in the face that we do now, and the organizations will not have so many crippled members asking for assistance, and the proportion of employees killed and injured to the whole number won't be 21 and 81 per cent. respectively.

Read the newspapers, railroad as well as brotherhood, so that you will get some of the theory of the business to fit you for a better place. Familiarize yourself with the advertisements of the company, train schedules, maps, names of the officers and where they are located, so that you can answer questions of patrons and others. Treat everybody politely and decently, as by your conduct and manners the corporation and management will be judged. Take advantage of what others have learned by the greatest of all teachers —experience.

After getting good competent men we need good track and equipment and sufficient and intelligent inspection to see that not only the track and equipment are kept in good repair, but also that the men keep in good physical and mental condition.

A method of inspection and repair by which the man who inspects will be required to have some mechanical experience and will at least know by name the different parts of the car, engine or structure he is supposed to examine, who can talk and understand English and comprehend what the result will be if he fails to discover defects and have them remedied, and who will report, not to a foreman whose duty it is to repair the defect, but to a superior whose business it is to find them. This is the sort of inspection necessary to prevent injury and loss. And when we do this the record will be different from the one above shown.

Then we want good rules and instructions (the fewer and simpler the better) telling how the trains shall be run and the business of the company conducted, and if it is true, as has been said, that one of the worst evils from which our country is now suffering is the failure to enforce all the laws on the statute book, I am afraid the same saying will apply to the operation of railroads. Too many rules, orders and bulletins are disregarded by employees, and that disregard not discovered or overlooked until some accident occurs. If there are any rules that are impracticable they should be cancelled, but until they are their observance by officers and employees should be insisted upon. The quickest and best way to get a bad rule or law cancelled or repealed is to enforce it.

And if you do not owe it to yourselves, your families, your fellow employees, consider whether you do not owe it to a company which has always paid you well and regularly for what you have done for it, that is noted for giving every man a square deal.

And last but not least, we want sufficient and efficient supervision. Poor Richard, the philosopher, never said a truer thing than that "The eyes of the master will do more work than both his hands." And as the business of a railroad increases and grows more complicated every day, it requires more and better, and not less, supervision. If the number of employees and the tonnage of trains increase five fold, so should the supervision increase, in order that the business be conducted in accordance with the rules and that safe and economical operation be secured, and there should always be enough supervision to obtain this necessary result. The more independent the labor, the lower the class of labor, the more and better the supervision required.

After we get the men, the track, equipment, rules and supervision, we should see that all the employees know and understand the rules and their duties and how to perform them. Some day we will have a training school for this purpose, just as the Government has for its soldiers and sailors, and many municipalities for their police. But you should study and familiarize yourself with the time-table and rules, the same as you have done with your pay schedule—you all understand that. The rules were made by men who have come from the ranks, who know from actual experience what the failure to observe them means to our patrons, to yourselves, and the company, and if you don't understand them, have someone who does explain them to you until you know them by heart and exactly what they mean, and when you have done this, comply with them and things will go better; there will then be few accidents, suspensions and discharges.

Do the company's business the same as you would your own. If the time ever comes when you are unwilling to do this, quit. Think before you act, not afterwards, as then it will be too late. And remember that other lives, perhaps that of some one near and dear to you, may depend upon your acting and doing immediately, and not to-morrow, the right thing and in the prescribed way.

Make it your first duty to always look after your employer's interest, to protect the lives and property intrusted to your company, as well as the lives of those crossing over its tracks and those of your fellow employees, then will come to you not only the knowledge of duty performed, but promotion in position and increase in salary. That is why your president, general manager, and the whole push are where they are now, instead of working in the ranks.

Never go out without sufficient rest. Don't try to get in too many miles or hours for the pay there is in it, as you may get hurt or killed doing so, or injure someone else. Don't undertake to run an engine over a piece of track which you have never been over without a pilot. If called for such a run, don't be afraid to ask for a pilot, and then make the run with the greatest care.

When an order is given you in writing, or verbally, if you don't understand it, ascertain exactly what it means before you undertake to execute it, and if you understand what is wanted, but don't know how to do the thing, find out from someone who does before, not after, you have made a mistake, as it will take you less time to learn to do it right than it will to explain why you did it wrong, and by so doing you may prevent yourself or someone else getting hurt.

Someone said that "Few things cost less than encouragement and commendation and fewer still are worth more." So I say to you, division officers, remember that occasionally and see if it won't help to get good service, and when you have occasion to call a man down don't do it in public, as it only humiliates and makes him sore.

With additional care on your part and that of your fellow workers, together with more and better supervision, based on the theory that it is equally as important to see that rules and orders are observed as it is to issue them, that men are more important in the running of a railroad than things, the next time I visit you I will be the bearer of the good news that our accidents and consequent losses have been reduced one-half and that you men have done your share in bringing about that beneficent result.

The Betts Car Reporting System.

A new system to be used in making up accurate car records has recently been installed on the Chicago & North-Western Railway by E. E. Betts, Car Service Agent, whose invention it is and who has applied for a patent covering it. The Betts system is a further development of the process of car recording. The car transcribing system was described in detail in the *Railroad Gazette* of February 2nd as in use on a number of railroads, including the Chicago & North-Western. Under that system, conductor's, agent's and interchange reports, instead of being passed about among the record clerks, are transcribed by typewriters on a perforated stiff paper ribbon, on each tag of which are written the essential facts of one car movement. The tags are torn apart, sorted, and each sorting turned over to the proper record clerk. The book records are then made up directly from the transcribed tags. This system makes a great saving in time and efficiency, since it avoids the necessity of passing reports about from clerk to clerk, each of whom enters on his book only the numbers which belong to his assignment. Under Mr. Betts' new system, this advantage is retained and, at the same time, an additional saving of time and labor is brought about by doing away altogether with the transcribing process. As shown in the accompanying illustrations, the original forms for the reports are made up in such a way that one copy of each report can be cut up without transcribing as soon as it reaches the office of the Car Service Agent. By using the round perforation in the end of the record for each car, the records, after being separated, can be filed on a peg, just as under the transcribing system.

There are three kinds of report blanks in use on the Chicago & North-Western: The freight conductors' wheel report, the daily interchange report of cars received, and the daily interchange report of cars delivered. The wheel report is printed on white paper, the received interchange report on yellow paper and the delivered interchange report on pink paper. The forms are bound in books with a paper cover. They are, on the C. & N.-W., in sets of three, one narrow sheet, the original, and two wide sheets, with 50 sets or 150 individual sheets to the book. The original narrow blank of the conductor's train report is sent to the office of the Car Service Agent, who keeps a running record of the cars; the duplicate is forwarded to the Auditor of Car Accounts for statistical purposes, and the triplicate to the local Division Superintendent. The original, which goes to the Car Service Agent, does not include the latter half of the record left blank in the illustration of the conductor's report, the information given ending with the date column. The same is true with the original of each of the two interchange forms. The copy sent to the Car Service Agent is immediately cut up into separate slips, each covering one car movement. On the Chicago & North-Western the average day's work of from 50,000 to 75,000 records can be cut up in an hour and a half, and it is the exception to have a single record spoiled. After the reports are cut up into separate records, the records are sorted on spindles, each covering the series assigned to a record clerk, just as under the transcribing system, and the record clerks are thus able to devote all their time to effective work, instead of having to spend a great deal of it in searching out the particular cars which come under their particular books. Information as to car initials,

LEFT STATION DATE M.
ARRIVED STATION DATE M.
Patented applied for, Jan. 1906, E. E. Betts. **CABOOSE CARS** Form 950.

Number	Taken at	Left at	Miles Run

	Initials	Loaded	Empty	Taken at	Left at	Date
1	C. & N. W.	96326		904	906	3/6
	Initials	Loaded	Empty	Taken at	Left at	Date
2	C., R. I. & T.		150120	904	910	3/6
	Initials	Loaded	Empty	Taken at	Left at	Date
3						
	Initials	Loaded	Empty	Taken at	Left at	Date
29	No. Pac		14468	923	934	3/5
	Initials	Loaded	Empty	Taken at	Left at	Date
30	Erie	101822		923	929	3/5

Report of Freight Train run by

Conductor.

CONTENTS	DESTINATION	Car Mileage	Wgt. of Car & Cont's in Tons	To be left blank TON MILES

Chicago & North-Western Freight Conductor's Report Used Under Betts Car Reporting System. Filled in Portion Is Original Sheet Sent to Car Service Agent; Blank Portion Represents Additional Spaces on Duplicate and Triplicate. Round Perforation for Filing Shown on Original.

Report of Delay.

Report the exact time in hours and minutes your train is delayed. State where detention occurs and cause.

REMARKS.

INSTRUCTIONS.

In reporting cars which belong to this Company, you will please be careful to give the initials "C. & N. W." and not "N. W." or "C."

"C., St. P., M. & O." cars should be reported as such and not "O."

Whenever Baggage, Mail or Passenger cars are taken in Freight Trains, a special report should be made on Blank, Form 957. Original to be sent to Car Service Agent, Chicago, duplicate to be sent to Division Master Mechanic.

In addition to reporting Passenger Equipment cars on Form 957 you will also report them on this blank, Form 950.

Be careful to write the Initials and Numbers plain, and be sure to report them correctly. When cars are set out of trains on account of being disabled or heavy train, report the same.

The weight of loaded cars and contents must be reported in Tons. If the car weighs 20,000 lbs., and contains 22,450 lbs. of freight, it should be reported as 21 Tons, because it weighs nearer 21 Tons than 22 Tons. If the car weighs 22,000 lbs. and contains 41,620 lbs. of freight, it should be reported as 32 Tons, because it weighs nearer 32 Tons than 31 Tons. The stenciled weight of empty cars must be reported in like manner. For instance, a car is stenciled as weighing 22,600 lbs., it should be reported as weighing 11 Tons; if 23,500 lbs., it should be reported as weighing 12 Tons.

ACCIDENTS.

When accidents occur, causing cars to get off the track, give initials, number and contents of all cars off, also give numbers of such cars left at the wreck. If the contents of any cars are transferred, give the initials and numbers of such cars.

TO WHOM THIS REPORT SHOULD BE SENT.

Original or narrow sheet to be folded *once only* and sent to Car Service Agent. Duplicate to Auditor Car Accounts. Triplicate to your Superintendent. Report to be made at end of each run without fail.

W. E. MORSE,
General Superintendent.

950

Chicago & North-Western Railway Co.

MADISON DIVISION.

FREIGHT CONDUCTOR'S REPORT.

Train No...... *GOING*.....
Left..... *Station at*.....M.
.....190...
(Name of month must be written.)
Arrived at..... *at*.....M.
.....190...
(Name of month must be written.)
..... *Conductor.*
..... *Brakeman.*
..... *Brakeman.*

CABOOSE CARS.

Caboose No.	Taken at	Left at	No. Miles Run

Report ALL Caboose Cars in train in above spaces extra Caboose Cars, as well as the Regular Caboose.

ENGINES.

Engine No.	Taken at	Left at	Mileage	Engineer	Tons Coal Used

Report ALL Engines used en route, Helpers or Pushers, as well as the regular engine, and show where each is taken and left, and mileage made by each.

Reverse Side of Freight Conductor's Report Used Under Betts Car Reporting System—Chicago & North-Western.

Form 286.

CHICAGO & NORTH-WESTERN RAILWAY CO.

DAILY INTERCHANGE REPORT OF CARS

Delivered to _____ R. R.

at Station _____ Date _____ 190

FROM M. TO M.

Patent applied for. E. E. Betts. This sheet to be sent to Car Service Agent, Chicago.

I certify that these Cars were delivered,

_____ Agent

_____ R. R.

_____ Agent C. & N.-W. Ry.

	CAR NUMBER					BILLED FROM	BILLED TO	CONTENTS
INITIALS	LOADED	EMPTY	Del'd by C. & N.W. Ry. to	AT STATION	DATE	Original Point of Shipment	Final Destination	
1			R.R.					
INITIALS	LOADED	EMPTY	Del'd by C. & N.W. Ry. to	AT STATION	DATE			
2			R.R.					
INITIALS	LOADED	EMPTY	Del'd by C. & N.W. Ry. to	AT STATION	DATE			
3			R.R.					
28			R.R.					
INITIALS	LOADED	EMPTY	Del'd by C. & N.W. Ry. to	AT STATION	DATE			
29			R.R.					
INITIALS	LOADED	EMPTY	Del'd by C. & N.W. Ry. to	AT STATION	DATE			
30			R.R.					

Delivered Interchange Report, Betts System; Chicago & North-Western. Original and Latter Half of Duplicate and Triplicate.

car number, where taken, where left, whether loaded or empty, and the date, is here recorded. Records of foreign cars can be sorted into accounts or books, and all local cars into ending numbers, books or any combination of methods which is desirable. The rest of the information as to contents, destination, car mileage, etc., is included only in the reports which go to the Auditor and Superintendent.

The interchange reports are printed in similar form, showing initials, number, loaded or empty, name of railroad received from or delivered to, date, and on the duplicate and triplicate, original point of shipment, final destination and contents. An innovation in the delivered interchange report is that each of the individual records contains complete information showing the delivering line and to whom delivered, thus making it possible to send out these records, after they have been used for record purposes, instead of junction cards, a feature which means a saving of one or more clerks in the average large office. All that is necessary is for the reporting line to put the separate slips covering cars of one road after they have been passed through the records of the home office, in an envelope and mail them to the line which owns the cars. To the roads also which transcribe junction cards received, there is a saving of time, as slips received from a road using the Betts system may at once be sorted without the necessity for transcription.

There is also in use, in addition to these three reports, a report to be furnished by stations and yards within large switching terminals, where cars are handled from yard to yard or station to station within switching limits, and no regular train reports made out, as on road trains. This is arranged on the same principle as the other three records.

The additional work required from conductors and agents under the new system is small. At first it takes a short time for men to get accustomed to any new system, but after they get used to it, the new forms work as smoothly as the old. Particularly because there is more space on the new form, a great many conductors on the Chicago & North-Western, where the Betts system has been in use less than three months, prefer it to the old form. The latter half of the form, including the information in regard to contents, destination, car milage and weight, can be dittoed, as under the old form.

The advantages claimed for the Betts system are, first and most important, accuracy. All errors in transcribing (and errors are sure to be made) are eliminated, since the record which comes to the clerks is in the conductor's or agent's original handwriting. It is easy to see that this makes for accuracy, for it is an axiom that the fewer handlings, the fewer errors. With this system one handling is saved. Next in importance, the Betts system saves time. From actual use on the Chicago & North-Western it has been shown that car records are entered in the record books under the Betts system from 24 to 48 hours earlier than with the use of the transcribing system. This means all the more when it is taken into account that the transcribing system was a gain of considerable time over the previous system, or lack of system, without it. Cutting the records can be done by a boy, separating 2,000 records to the stroke, and the cost of cutting records is about 1¼ cents per 1,000. The advantages of any saving in time in car recording are obvious, particularly in view of the fact that the shipping public is coming to appreciate more and more the desirability of being able to get

Form 286A.

CHICAGO & NORTH-WESTERN RAILWAY CO.

DAILY INTERCHANGE REPORT OF CARS

Received from _____ R. R.

at Station _____ Date _____ 190

FROM M. TO M.

Patent applied for. E. E. Betts. This sheet to be sent to Car Service Agent, Chicago.

I certify that these Cars were delivered,

_____ Agent

_____ R. R.

_____ Agent C. & N.-W. Ry.

	CAR NUMBER					BILLED FROM	BILLED TO	CONTENTS
INITIALS	LOADED	EMPTY	RECEIVED FROM R. R.	AT STATION	DATE	Original Point of Shipment	Final Destination	
1								
INITIALS	LOADED	EMPTY	RECEIVED FROM	AT STATION	DATE			
2								
INITIALS	LOADED	EMPTY	RECEIVED FROM	AT STATION	DATE			
3								
28								
INITIALS	LOADED	EMPTY	RECEIVED FROM	AT STATION	DATE			
29								
INITIALS	LOADED	EMPTY	RECEIVED FROM	AT STATION	DATE			
30								

Received Interchange Report, Betts System; Chicago & North-Western. Original and Latter Half of Duplicate and Triplicate.

prompt information about shipments. The third advantage of the Betts sytem is economy. With its use the entire cost of transcribing records is saved by railroads which now have the transcribing system, and on railroads where transcribing is not being done, the new system makes possible an increase in the assignment of work to record clerks of approximately 50 per cent. This, as already explained, is because the records assigned to each clerk, and no others, go directly to the clerks, thus doing away with the skipping difficulty.

The best proof of the advantages of the Betts system is its success in actual operation. It was put in effect on the Chicago & North-Western February 1st, when all machine transcription of records was discontinued. The new system is working with great success. As a practical result of its use there is obtained a better car record, a more current record and a more economical record. The total cost of transcribing in a large car record office amounts to perhaps 10 per cent. of the total pay-roll expense, and under the Betts system in addition to its other advantages there is a money saving to this extent in wages, stationery and typewriters.

Tie Treating on the Southern Pacific and the Santa Fe.*

Mr. Kruttschnitt.—I think some stress should be laid on the fact that no one method of treatment can be prescribed that will suit all kinds of timber, different woods require entirely different treatments, as is evidenced by the fact that we are not able to adopt a standard treatment that will do for all of our lines; for instance, for the Wyoming mountain or lodgepole pine, and for the Louisiana and Texas yellow pines, we prescribe 90 days for air-seasoning and find that this reduces the time of treatment and is in every way beneficial, while on the Pacific Coast it is found that the Douglas fir, which we use to a great extent for tie timber, takes the treatment best without seasoning.

We doubt whether bolts, "S" irons, or other devices will be of any benefit to prevent ties that are badly checked from checking further. We think the specifications should be rigidly enforced, and would not attempt to treat badly shaken or checked ties.

All machine work to be done on timber should, without doubt, be done before treatment.

We have found it best at all of our works to apply a vacuum before admitting live steam. We think it promotes the seasoning of the timber by removal of the fermentable sap, the retention of which serves to promote decay.

We raise the steam pressure to 25 lbs., but prefer to specify the temperature above which the timber shall not be heated rather than the steam pressure.

We have found with Pacific Coast timbers that they are not injured if the (upper grade of) temperature be limited to 280 deg. Fahrenheit, and the eastern yellow pines are not injured if the temperature be limited to 250 deg. Fahrenheit.

We use a pressure of 125 lbs. to 145 lbs. per sq. in. for forcing the chloride into the ties.

We use only one-half the amount of dry chloride per cubic foot (our specifications call for ¼ lb.) that the Committee recommends, and we never allow the solution to go as high as 5 per cent. Our standard solution is 1.7 per cent., and we do not permit it to rise above 2.5 per cent. as a maximum.

While the heating of the solution is all right, we see no reason in burnettizing why the cylinders should be provided with steam coils. It is an added expense, and an added device to rust out and be corroded by the chloride of zinc.

Creosoting.—The amount of creosote per cubic foot of tie seems to us ample. While we do not use this treatment for ties, we have used it extensively for trestle timbers and bridge ties and have never had any trouble with timber impregnated with this amount of oil. We heat the oil rather higher than the Committee recommends before admission, using a temperature of from 170 to 180 deg. Fahrenheit.

The method of measuring the solution absorbed, by gage readings on the tank holding the stock supply of the solution, is fallacious, unless the coefficient of the measuring tank is obtained for correction. The apparent injection of both zinc chloride and creosote may be simply evidence of compression of bubbles of air, gas, etc., in the timber.

I quote clauses of our specifications bearing on this subject:

"At regular intervals of about 30 days during operation and whenever there is a change in the character of the timber to be treated, make a coefficient for the measuring tank as follows:

"When injecting, pump from the measuring tank into the retort the exact net number of inches theoretically required for the timber, without coefficient of any kind; let off pressure from bottom of retort through a pipe into and over top of measuring tank; note exact inches returned; subtract this from the theoretical number of inches. This gives the inches remaining in the retort. Then the ratio of 100 times the inches flowing back to the inches remaining gives the percentage to be added, in every case, to the theoretical inches required. Example:

60 in. required theoretically;

12 in. flowed back;

48 in. remaining; then $\frac{100 \times 12}{48} = 25$ per cent., the coefficient required.

This coefficient is the addition to be made to the theoretical amount to be pumped from the measuring tank into the timber.

"This must be corrected at intervals not exceeding two days (preferably each day at noon) by taking stock of material used in a given interval and the amount of timber treated in the same interval. These pounds of preservative material divided by the cubic feet of timber treated should correspond to the amount of preservative per cubic foot desired."

In creosoting, the individualities of the timbers treated must be consulted. The method given in the proposed specifications is that long in use in the east, but it is absolutely inapplicable to Douglas fir.

With Douglas fir, our standard method of treatment is to run the trucks into the cylinder, close the door, fill with creosote (120 deg. to 140 deg. Fahrenheit), open up the vents and allow the vapors to pass out under atmospheric pressure through the condenser, which is only for use in measuring the rate of vaporization and recovering a certain amount of light oil which is carried over mechanically during the process. When the timber is properly dried, fill the tanks with creosote, close the vents, and put on pressure, injecting oil from the measuring tank.

At our works in Texas we use the method outlined by the Committee, heating the oil up to 170 or 180 deg. Fahrenheit before admission.

A standard analysis for the oil is much to be desired, but we do not know that there is one.

Mr. Faulkner.—In regard to the proposed specifications governing method of piling ties before treatment, as also the several different forms of the treatment itself—it seems to me the Committee is undertaking quite a task in attempting to frame specific rules governing these matters in such a wide territory as that covered by the Association, and they probably will not be followed excepting where they agree with local conditions or practice.

Take the question of piling ties to start with; we have given some attention to this matter, and for that reason fully realize its importance, but find that for the climate and woods of eastern Texas, where the rainfall is heavy, and at certain seasons of the year the atmosphere very warm and humid, the form most suitable there is not suited to the climate and woods of the Rocky Mountain region. In east Texas our ties are hauled to the right-of-way, inspected and brought into the Somerville storage yard as quickly as possible after making, and there piled on the 1 x 8 plan, so as to give the best opportunity for quickly drying out and for the rain to fall off. We tried the same plan in New Mexico, but found the hot sun and dry air seasoned the outside of the ties so fast that they checked badly, so we make piles 7 x 7, with the outside ones on edge where the shape will permit, just as suggested. In the case of cypress ties, we pile them as solid and close as possible in order to hold the water or sap in the wood. As to the time of drying; this, too, depends somewhat on local conditions. In Arizona a certain lot of ties cut in June lost 33.1 per cent. of their weight in the first 30 days and in the next 90 the total additional loss in weight was only 1.6 per cent. Ties cut in December were held six months before the loss in weight equaled 30 days in the other case, and until the warm spring days, practically no decrease in weight occurred after the first month.

If we expect the best results out of treated inferior woods, we must give them a fair show, and this is not done in putting them in the track just as soon as they are received after treatment, when they have probably 70 or more pounds of water in each tie; and when some of this water will squirt out as the spike is driven. What can one expect from a soft pine tie under such conditions, but rail-cutting, loose and damaged spikes and unsatisfactory service? A year ago one of the leading roads in the west noticed their treated ties were corroding spikes. After full investigation I reported that, in my opinion, where the ties were allowed to properly dry out before insertion, the damage from corrosion was scarcely noticeable, but where the contrary was the case, then some corrosion took place; but, even then, nothing like so serious as to give concern. Now that so many roads are using Burnettized or Wellhouse ties, special attention should be called to the necessity of seasoning after treatment, even if more ties are ordered to admit of this, as I believe it would pay good interest on the investment.

Now as to treatments; as the Committee knows, we are adopting the Rueping process at Somerville, while continuing Burnettizing in New Mexico and Arizona. We use half a pound of dry zinc-chloride to the cubic foot; the Southern Pacific uses a quarter of a pound; the Union Pacific four-tenths; the Great Northern, I believe, something over a pound. I hardly think these roads will

*From letters from Mr. Julius Kruttschnitt, of the Union Pacific and Southern Pacific, and Mr. E. O. Faulkner, of the Atchison, Topeka & Santa Fe, published by the American Railway Engineering & Maintenance of Way Association, in connection with the report on ties, presented to the Chicago meeting, March, 1906. The report of this meeting was published in the *Railroad Gazette* of March 30, page 332.

change their methods simply because the Committee says half a pound is the correct quantity. If the Committee is going into this subject, I would suggest that it be in the nature of a recommendation rather than as an absolute proposition. Twenty pounds steam pressure is provided for. Where cylinders are well jacketed, this may be sufficient, but where they are not, I think allowance should be made for outside temperature. From one to five hours' steaming is laid down, depending upon the character of the timber and its conditions; would this be sufficient in the case of Oregon fir? I do not know, and have asked the Government officials if they have any tests on Pacific Coast timbers, but they say not. The period covers the time of our steaming, as we pile the timber long enough for good seasoning beforehand; but there are portions of the year where 90 days does not accomplish much. The Committee also stipulates that the solution should be heated to 140 deg.; is there any special significance in this temperature, or is it simply such as might be expected to accomplish results? It is possible in some of the oldest plants there are no heating coils in the cylinders, neither thermometer flanges, nor sap drums, and I believe the Committee should recommend that in new plants hereafter put up these appliances should be provided.

Creosoting Treatments.—One hundred pounds pressure is required; this is seldom necessary in the case of loblolly pine with 10-lb. treatment, as the wood will take up almost that quantity under the vacuum; it would be better to say the pressure must be continuous and such as will give the desired absorption. I also think the timber should stay in the cylinder long enough after treatment to take care of the drip, and that the final gage reading should not be taken until after this has been forced back. I would not allow anything like 10 per cent. water in the oil before having steps taken to reduce it; I believe with proper appliances it is quite possible to keep it out, and for this purpose would require a sap drum under the cylinder to take care of any water or condensation at the end of steaming and vacuum periods. I think the working temperature of 140 deg. is too low and that it should be at least 175. I saw a sample of oil sent in by a treating plant for analysis, which showed that it began to solidify at 153, it being fully liquid at 160; I know this is an extreme case, but I think 140 is too low. Again, in creosote, where the treatment is in weight pet cubic foot and the tank gage shows gallons, the weight of the oil per gallon is an important feature, especially as creosote expands, so that a gallon at a low temperature weighs more than it would at a higher temperature; sometimes more than half a pound difference, which, on a 10-lb. treatment, equals 5 per cent. In our commercial treatment we therefore require the temperature of the oil to be taken at time of forcing it into wood, and after forcing back; then strike an average of the two in case there is any appreciable difference.

Washington Correspondence.

WASHINGTON, April 24.—No progress whatever has been made with the railroad rate bill during the past week unless getting Senator La Follette's three-days' speech out of the way can be called progress. This speech, which was probably delivered chiefly with the view to its circulation in Wisconsin, has had no effect in the Senate and has attracted little attention in Washington. There has been some discussion among Senators of the review propositions that have been submitted, but the conservative leaders have been disposed to allow things to drift until after Senator Spooner's reply to Senator Bailey's speech on the power of Congress to deny to the courts the right to enjoin temporarily the enforcement of an order of the Commission. Senator Spooner's reply will probably be delivered to-morrow, and it is expected to be a complete answer to the speech of the Senator from Texas. When this speech has been delivered the principal arguments of the conservative Senators will all be before the Senate and the effort will then be made to get together on an amendment that will provide for broad review and will leave the courts free to suspend an order pending the review proceedings.

Many estimates as to how Senators will line up on this amendment have been made, but it is still too early to make any positive predictions. The only thing that can be said with reasonable certainty is that the Bailey proposition to deny to the courts the power of suspension will be defeated by a very substantial majority, and that the review amendment that will be framed by the conservative leaders will be adopted. There are various estimates as to the majority that this amendment will have, but many Senators are still in the doubtful list, and while there seems to be ground for the belief that there will be a majority for the amendment it will take the votes of these doubtful Senators to settle the question whether it shall be a small majority or a large one.

There are some Senators who profess to believe that the difficulty of securing a majority of the Senate in favor of any important amendment will be so great that the Hepburn bill will finally be passed in substantially the form in which it reached the Senate from the House of Representatives. Such a result is extremely improbable, however, for the reason that many of the Senators on both sides of the chamber are convinced that the bill in its present form is unconstitutional, and that it would not stand a test in the United States Supreme Court. It is probable that a majority of the members of the Senate believe that, whether a review amendment is adopted or not, if the bill is to be made constitutional the provision conferring the rate-making power on the Commission must be amended so as to provide a specific rule or definite standard for rate making.

The advocates of amending the bill so as to provide for broad review and for the suspension of an order of the Interstate Commerce Commission pending review have had their arguments much strengthened during the past week by the presentation by Senator Lodge of a compilation showing that the members of the Interstate Commerce Commission, collectively, in their annual reports and in the bill prepared by them, and individually, as witnesses before the committees of Congress, have uniformly and unanimously advocated legislation that would give them the power to make rates subject to broad judicial review and to the right of the courts to suspend an order pending such review. The Commissioners have advocated review going not only to the question of the constitutionality and legality of an order but extending to the question as to the reasonableness of the order. They have gone even further than this and have advocated giving the courts authority to inquire as to the reasonableness of the original rate sought to be set aside by the Commission. It is contended that the recommendations of the Commissioners, especially as to the extent of their own powers, ought to have great weight with Congress, and that the legislative branch of the Government ought to be reluctant to confer on administrative officials autocratic powers and freedom from judicial restraint in excess of what they themselves are seeking.

J. C. W.

Train Accidents in the United States in March.[1]

bc, 1st, 2 a. m., Michigan Central, Bay City, Mich., butting collision of freight trains; one brakeman killed.

bc, 1st, Pittsburg & Lake Erie, Belle Vernon, Pa., butting collision between a passenger train and a freight, due to a misplaced switch; both engines wrecked; three trainmen injured.

bc, 1st, 9 p. m., Union Pacific, North Platte, Neb., butting collision between a westbound passenger train and an eastbound freight, due to a misunderstanding or misreading of orders. Both engines and three cars were wrecked. There was a blinding snowstorm at the time.

2nd, Colorado Southern, Wendover, Wy., a passenger train broke through a bridge and the engine and first two cars fell into the canyon. The engineman, fireman and one mail clerk were injured, the fireman fatally. It is said that the derailment was due to the weakening of the birdge by a fire which had been set by tramps.

xc, 2nd, Chesapeake & Ohio, Thurmond, W. Va., a freight train consisting of two engines and 34 cars became uncontrollable and ran at high speed down grade three miles, and collided with some freight cars; one engineman killed.

bc, 3rd, Delaware, Lackawanna & Western, Lyons, N. J., butting collision between a passenger train and an empty engine; one fireman killed, one other trainman and several passengers injured.

eq, 4th, Southern Pacific, New England Mills, Cal., a freight train was derailed by a broken wheel, making a bad wreck. A man riding on one of the cars was killed and another injured.

dr, 5th, Southern Railway, High Point, N. C., a passenger train was derailed at a defective joint and two passenger cars and a freight car fell down a bank. Twenty persons were injured.

dr, 5th, Atchison, Topeka & Santa Fe, Tolpec, N. M., a passenger train was derailed by spreading of rails and five cars were ditched. Seven passengers were injured.

*eq, 5th, Pennsylvania Lines, Loudonville, Ohio, a train consisting of an engine and a caboose was derailed. The engine fell into the mud at the side of the road and the caboose caught fire and was burnt up. The fireman was killed and two other trainmen were scalded. The derailment is said to have been due to a broken flange.

unx, 5th, Baltimore & Ohio, Smithfield, W. Va., a locomotive was derailed and overturned and the engineman, fireman and a brakeman were burned to death.

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defects of roadway.
eq	Derailments; defects of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

dr, 6th, Southern Railway, Frost, S. C., passenger train No. 9 was derailed by a broken rail and six passengers were injured.

†xc, 7th, Delaware & Hudson, Saratoga, N. Y., a passenger train, unexepectedly stopped by an accident to a freight train ahead, was run into at the rear by a following passenger train, and the rear car was wrecked. Two passengers were killed and 12 injured, two of them fatally.

*unx, 7th, 4 a. m., Erie road, Binghamton, N. Y., passenger train No. 7, second section, was derailed and wrecked. The wreck quickly took fire, but the flames were extinguished by the city fire department. The engine and first three cars fell down a bank. The engineman and fireman were injured, the former probably fatally.

bc, 8th, Kansas City Southern, Bon Ami, La., butting collision between a passenger train and a freight, due to a misplaced switch. One fireman was killed and both enginemen were injured, probably fatally.

xc, 10th, Southern Railway, Philadelphia, Tenn., collision of freight trains, wrecking 15 cars. One fireman was killed and five other trainmen were injured.

*rc, 11th, Baltimore & Ohio, Fostoria, Ohio, an eastbound freight train which had been stopped for water was run into at the rear by a following freight, and the caboose and some of the cars were thrown upon the westbound track. A westbound passenger train, coming along a moment afterward, ran into the wreck and its engine and first four cars were piled up. One fireman and one mail clerk were killed and another mail clerk was fatally injured. The engineman and one passenger were also injured. The wreck took fire and was partly burnt up. A number of persons were badly burnt by the flames while trying to rescue the imprisoned passengers and a number were also scalded by steam.

bc, 11th, 4 a. m., La Marque, Tex., butting collision between a southbound freight train of the Missouri, Kansas & Texas and a northbound newspaper train; one brakeman killed, two other trainmen injured.

bc, 11th, Chicago, Burlington & Quincy, Akron, Col., butting collision of passenger trains, due, it is said, to the failure of an operator to deliver an order. A mail clerk was killed and four trainmen were injured.

xc, 12th, Lehigh Valley, Pittston Junction, Pa., collision between a passenger train and a freight; one trainman killed.

*†bc, 16th, 2 a. m., Denver & Rio Grande, Adobe, Col., butting collision between westbound passenger train No. 3, drawn by two engines, and eastbound passenger train No. 16, making a bad wreck. The wreck quickly took fire and many passengers were burned to death. The total number of persons reported killed in the collision is 22, and of injured the same number. There was a blinding snowstorm at the time, accompanied by intense cold. The collision was due to the non-delivery of a meeting order to the westbound train at Swallows, a station a short distance east of Adobe. The operator at this station had been asleep and afterward, when asked by the train despatcher if No. 3 had passed, replied that it had not. He then took the meeting order, but the train had passed. This collision was reported in the *Railroad Gazette* of March 23, page 315.

bc, 17th, 5 a. m., Boston & Maine, West Windham, N. H., collision of freight trains wrecking both engines and 10 cars. Three trainmen were killed and three injured.

bc, 17th, Louisiana & Arkansas, Long Springs, La., butting collision of freight trains, due to the overlooking of an order by the men in charge of one of them. Both engines were wrecked and several cars were damaged; one fireman was killed and two other trainmen were injured, one of them fatally.

xc, 17th, Baltimore & Ohio Southwestern, Washington, Ind., a passenger train ran over a misplaced switch and collided with some freight cars standing on a side track; three passengers injured.

unx, 17th, Chicago, Indianapolis & Louisville, Bedford, Ind., the tender of the engine of a passenger train was derailed at a curve and, with several cars, fell down a bank. Five passengers and one trainman were injured.

unx, 18th, Missouri Pacific, Willis, Kan., the locomotive of a freight train was derailed and overturned, and the fireman was killed.

†xc, 19th, 1 a. m., Chicago, Milwaukee & St. Paul, Davis Junction, Ill., collision of freight trains in the yard, due to mistake in or misunderstanding of hand signals; and two cabooses and eight cars were wrecked. A drover in one of the cabooses was killed and one trainman was injured.

eq, 19th, St. Louis & San Francisco, Jasper, Ala., a freight train was derailed by a brake beam which fell on the track and 12 cars broke through a trestle bridge and, with most of the bridge, fell to the ravine below.

dn, 19th, Chicago, Burlington & Quincy, Lockbridge, Iowa, a mail bag thrown from a car in a passenger train struck a switch-stand, broke it, and thereby loosened the switch rails, so that several cars of the train were derailed and thrown against the cars of a work train standing on a side track. One employee on the work train was killed and 12 were injured, four probably fatally.

unf, 19th, Mobile & Ohio, Fletcher, Ala., a freight train was derailed at a washout and the engine was overturned. The engineman and fireman were injured, the former fatally.

rc, 21st, 4 a. m., Southern Railway, Bath, S. C., rear collision of freight trains; engineman and fireman injured.

unx, 22nd, West Jersey & Seashore, Atlantic City, N. J., a mixed train was derailed and one passenger car was thrown against a freight car on a side track, making a bad wreck. Two passengers and one trainman were injured.

unx, 22nd, Lehigh Valley, Honeoye Falls, N. Y., the engine of a passenger train was derailed and overturned, and the engineman and fireman were killed.

rc, 23rd, Lake Shore & Michigan Southern, Goshen, Ind., an eastbound freight train standing at a water tank was run into at the rear by a following freight, and several cars were wrecked. A part of the wreck fell on the westbound track and was run into by a westbound freight train. Five trainmen were injured.

xc, 23rd, New York Central & Hudson River, Rochester, N. Y., collision of empty passenger trains; one engineman fatally injured.

rc, 24th, Chesapeake & Ohio, Salt Lick, Ky., a freight train which had been stopped by reason of a defect in the locomotive, was run into at the rear by a following freight. The caboose and four cars were wrecked. One engineman was killed.

rc, 25th, Chicago, Rock Island & Pacific, Shawnee, O. T., a freight train was run into at the rear by a following freight, and the caboose was wrecked; four trainmen were injured.

†xc, 25th, 11 p. m., Texas & Gulf, Carthage, Tex., a passenger train collided with a freight train and 15 passengers were injured, three of them fatally.

dn, 25th, 1 a. m., Alabama & Vicksburg, Hickory, Miss., passenger train No. 2 was derailed at a switch and the engine and first two cars were wrecked. The engineman was killed and four trainmen were injured, one of them fatally. It is said that the switch had been out of order and had been spiked and that a freight train had run through it in this condition, thus leaving it insecure.

rc, 26th, 5 a. m., Philadelphia, Baltimore & Washington, Patuxent, Md., a northbound freight train which had for some reason unexplained run beyond a block signal which was set against it, was set back into the block section just vacated and was run into at the rear by a following passenger train, making a bad wreck. One fireman, one brakeman and two postal clerks were injured.

26th, Chicago & North-Western, Casper, Wyo., a work train broke through a bridge which had been weakened by a freshet and nine employees were killed and 12 injured.

*unx, 26th, 2 a. m., Atlantic Coast Line, Coosawatchie, S. C., a freight train was derailed and 10 cars were wrecked and destroyed by fire.

rc, 28th, Atchison, Topeka & Santa Fe, Riberia, N. M., passenger train No. 10 ran into the rear of a preceding freight train, wrecking the engine, caboose and several freight cars. The fireman of the passenger train was injured seriously, and several passengers slightly.

dr, 28th, Louisville & Nashville, Perth, Ky., northbound passenger train No. 2 was derailed at a curve in consequence, it is said, of spreading of the rails, and the engine and first three cars were overturned and wrecked. Three trainmen were injured.

rc, 29th, Louisiana & Arkansas, Hope, Ark., a freight train ran into the rear of a preceding freight; four trainmen injured, one of them fatally.

bc, 30th, Texas & Pacific, Escota, Tex., butting collision between a passenger train and a freight, badly damaging both endines. Six passengers were injured.

dr, 30th, New York, Chicago & St. Louis, South Whitley, Ind., a passenger train was derailed by a broken rail and the whole of the train except the engine and baggage car was ditched. The first passenger car was overturned and fell off a trestle, landing upside down in a stream, and the six cars following this fell down a bank. The reports say that no passenger was killed and that only 19 were injured. All of those in the smoking car, which fell into the stream, escaped with slight injuries.

xc, 31st, 2 a. m., Southern Railway, Gaffney, S. C., collision between a string of freight cars which had escaped control in the yard at Blacksburg, wrecking ten cars. The wreck occurred on a bridge and most of the broken cars fell to the stream below, but without doing serious damage to the bridge. Three trainmen were fatally injured.

dr, 31st, Atchison, Topeka & Santa Fe, Fulton, N. M., eastbound passenger train No. 10 was derailed by a broken rail and all of the cars except one sleeping car fell down a bank. One trainman and 15 passengers were injured.

unx, 31st, Southern Railway, Holton, Ga., the tender of the engine of an express train was derailed and, with a club car and three sleeping cars next following, fell down a bank. The club car was wrecked. Two trainmen and eight passengers were injured, one of the trainmen fatally.

Tunnel Under the English Channel.

Members of the London Municipal Council who recently visited Paris for the purpose of studying the public transportation service, were addressed by M. Sartiaux on the subject of the proposed Channel tunnel. According to M. Sartiaux, dread of the sea voyage is the reason why the passenger travel is so small. Although the total population of the Continent and the British Isles is about 150 millions the actual annual exchange of traffic over all lines between France and England is scarcely 1,200,000, while between France and Belgium, with a total population of hardly 50 millions, the annual exchange is about 4,000,000. Hence M. Sartiaux recommended to the London County Council a project for a tunnel with a total length of 33.5 miles under the Straits of Dover.

Several years ago preparatory work for such a tunnel was brought to an abrupt end by English public sentiment under the agitation of Lord Wolseley, who declared that it would threaten the territorial security of England. He preferred a bridge because it could be seen. But a bridge would obstruct navigation. Later there was a plan for a combined bridge and tunnel, by which about one-third the distance (on the English side) was to be traversed by a bridge and the balance by a tunnel. Such a plan would overcome the trouble about navigation and quiet patriotic solicitude.

It is to be hoped that the representatives of Great Britain in Parliament will see more clearly to-day than they have in the past the desirability of closer connection with the Continent, and that the great obstacle to communication between England and France will soon be removed.—*Le Journal des Transports.*

New Station of the Great Northern at Sioux Falls.

The new station which the Great Northern built at Sioux Falls, S. Dak., to replace the old frame station, burned down, is said to be the finest in South Dakota. The half-tone view published herewith shows that it is a good example of a design that is being used by a number of roads in towns of moderate size. The walls are granite up to the window sills and Menominee brick above that. The roof is slate. The two waiting rooms are each 30 ft. square, and the baggage room, adjoining the men's waiting room, is 30 ft. x 34 ft. Beyond this is an express room 24 ft. x 30 ft. The floors of the waiting rooms are made of Italian marble, the wainscoting, white enamel tile, and the ceilings pressed steel. Red birch is used throughout for finish, including the settees. Electric lights and a hot water heating plant are included in the station's equipment.

New Station at Sioux Falls, South Dakota—Great Northern Railway.

The building is surrounded by a vitrified brick platform 30 ft. wide on the track side and 12 ft. wide on the other three sides. The area between the building and Eighth street, the approach to the station, will be parked, with suitable driveways for carriages and express and baggage wagons, and the brick platform will be extended to the street.

We owe the engraving and information to the courtesy of Mr. Archibald Gray, Assistant General Freight and Passenger Agent of the Great Northern at Sioux City, Iowa.

The French opened their railroad in their province of Tong-King from the harbor of Hai-phong southwest to the Chinese border at Lao-Kai, about 300 miles, March 12. It, and a good deal more in the same quarter of the world, has figured in statistics of the mileage of Asia for three years or more. In 1901 the Chinese government granted a concession for the extension of this line some 300 miles in the same general direction through the province of Yun-nan, not to a corporation, but directly to the French government. It was estimated at first that this extension would cost $12,000,000 to $14,000,000; when work was fairly started on it the estimate was raised to $20,000,00. Now the company which is building it says that this will not be nearly enough. The French Minister of Colonies affirms, however, that, cost what it may, the road must be built, or France will lose all influence in China.

The New Haven's Proposed Joint Steam and Electric Service.

An excellent example of method in securing desirable relations between the railroad and the population which it serves was given in the conference between Mr. Mellen, President of the New York, New Haven & Hartford, and the citizens of Hartford, on March 20. After an address on subjects other than local ones, Mr. Mellen said:

I have been advised this is a good time and place to put in a little special pleading upon local matters, and I want to suggest a thought to you and see if I cannot secure your support and co-operation in a matter that seems to me of large interest to Hartford and its immediately surrounding country tributary to it commercially.

You are aware we have invested very largely in electric lines (and let me say here our operations have not been haphazard, nor to eliminate competition, but rather upon a well- defined plan), and in this particular district we are now better prepared to take the second step in the carrying out of our plans than anywhere else.

Here the arrangement of our lines is such we would like to make the experiment on a large scale to determine whether the two systems of traction—steam and electric—may not be worked in common, each supplementing the other; and we would like to electrify our steam tracks between here and Waterbury, and on the Central New England Railway between here, New Hartford and Springfield, and on the east side between here and Rockville, Melrose and Springfield, and upon the Valley Line between here and Middletown.

Instead of running to and from our stations through our yards, with all the switching and delays incident thereto, we want to connect at convenient points with the street railway tracks, and for interurban service make a circuit of the principal streets, collecting and delivering suburban shoppers at the store doors; and we believe both the city and the railroad will be greatly the gainers thereby.

No city on our lines is so favorably situated as is Hartford for the development of this idea. There is no question but a frequent and cheap service will prove to the great advantage of us both. Now, will you "get together," as your name implies, put your shoulder to the wheel, and help?

In order to do what we desire and feel is essential to a satisfactory result, we must run fast from the time we leave the connection on the present steam tracks and maintain a more moderate speed upon the street tracks; and to make the speed necessary with safety upon the steam tracks we must use a deeper flange—the

M. C. B. flange—on our wheels, and we cannot use it on the street tracks with the grooved rail, which we are bound by contract to use in your streets. Now, what we want is that you shall permit us to use on the streets where this suburban service will naturally go the "T" rails we use in other cities—New Haven, for instance—and, waiving none of your rights under your contracts, see how it will work, ascertain if the objections are real or imaginary, and years' trial, we will take up the "T" rails, restore the grooved rails, and go back to the old order of things. I am not afraid of your decision. I will trust you, and if you are afraid to trust me I will secure the performance of my part of the agreement by a good and sufficient bond to your satisfaction.

Let me suggest right here that I am advised the contract requiring the use of the grooved rail is not binding in law, but I have none the less required its observance on the part of our company, and shall continue to until we can agree amicably upon its modification.

I am still claiming to be worthy of your confidence, that I am "making good" in the handling of this property from day to day as fast as any human being can, and I am living in the hope that some day you shall believe, as I do, that the best policy is for us to work hand in hand in a common cause and share with each other the burdens of bad and the benefits of good times. I am acting on this belief at the present moment, and shall be most seriously disappointed if you force me to go elsewhere to try an experiment the conditions here favor beyond any other place, and it will be your fault if it must be so.

Now, get together, help me help you, and be the first city to have the most complete, efficient and cheap suburban service of any city in New England. The proposition is knocking at your doors—such an opportunity as no other city has to-day. Must I go elsewhere and prove how greatly you stand in your own light, or will you have everyone come here to see how it is done and envy you your advantages?

Both in opening and closing Mr. Mellen invited his audience to put to him any and all questions they chose.

ANSWERS TO QUESTIONS.

E. L. Steele asked what streets would be used by the proposed interurban service which would require the T-rail. Mr. Mellen said it would call for only a small proportion of the trackage. Everybody would save five cents now spent in taking a trolley at the station, and much time would be saved, too. Hartford, he said, is particularly well situated for this service. There are no competing railroad interests here to offer objections, and this city has suburbs in all directions. New Haven has the Sound on one side, and so less outlying territory to serve.

F. C. Sumner asked when this service could be expected, if the arrangement was made. Mr. Mellen said the Rockville bonding was now going on, but it was useless to hope for much until the bridge was ready. Until then suitable cars could not be run. But he would agree to have such a service between Hartford and Middletown during 1906.

Being told that to do business in Providence, only ninety miles away, a Hartford man must start the day before and lay off unfed forty minutes at Blackstone on the return trip, Mr. Mellen said the service might not be as good as desired, and he was glad to hear a real objection. He would look into the matter.

To a complaint that there was no evening service between here and Middletown, he said the proposed trolley on T-rails would give what was wanted.

He said nothing would be discontinued; the proposed business was an addition.

A traveler on the Central New England asked why 500-mile books were not good on that line when 1,000-mile books were. Mr. Mellen said he could see no reason why, and he would look into that, too.

"Phil" Hansling, superintendent of streets, was called up to give the objections to T-rails. He said there were many. These were reduced where Belgian blocks were used between the rails, but drivers of vehicles who did not turn at the right angle to cross were liable to accident and loss. He said the paving between the rails in Main street was probably the most expensive in the country and unnecessarily costly.

Mr. Mellen said he did not ask the city to waive any rights, but simply to let this experiment be tried. He said there were objections to many things, and it was always a question of balances. It was objectional to have the steam cars rush into and through the city, but the advantages exceeded the annoyances. Similarly he had confidence that, once tried, the proposed plan would prove to have advantages far overbalancing the disadvantages. He said there were many cities that would sit up nights to get the chance that is now offered to Hartford.

The talk throughout was good natured and abounded in quick hits which were much appreciated. At the close of the meeting the club, by a rising vote, on motion of Mr. Sumner, gave Mr. Mellen a vote of thanks.

The Earthquake.

The material damage done by the California earthquake of April 18 to the railroads, outside of San Francisco, appears to have been comparatively small. The most serious report was that of the subsidence of the roadbed for a number of miles, but later official reports indicate that the damage, not the complete destruction, of an aggregate of two miles of track, in different places, was the only real basis for this report. This damage is said to have been quickly repaired. None of the railroad companies' boats in San Francisco Bay appear to have been damaged, and the large and costly ferry house at San Francisco escaped fire. The papers say that the tall tower on this ferry house is to be taken down. The track and buildings of the Coast Line division of the Southern Pacific, which enters the city from the south, are presumably badly damaged within the limits of the city, though the terminal buildings at Third and Townsend streets are said to be usable.

The railroads and express companies are all carrying food and clothing to San Francisco free, and are pursuing the same course with refugees leaving the city. By Tuesday of this week, six days after the earthquake, many thousands of people had left the city for temporary homes in other places. Considerable numbers of refugees had to be fed by the public authorities or charitable persons as far east as Salt Lake City. The telegraph companies are serving the people of the city without charge, and the San Francisco postmaster accepted letters to be forwarded without either envelopes or stamps.

Carloads of food, clothing and other necessary supplies were sent from scores of cities in the East. West of Chicago these shipments were made into full trains. These trains were run at express speed, regular passenger trains being sidetracked where necessary. It is understood that the Southern Pacific and the Atchison, Topeka & Santa Fe will reduce their regular rates on building materials going to San Francisco. A Chicago reporter estimates that the free service given by the railroads will amount to $3,450,000 during the first month following the disaster. The Secretary of War probably will order 2,500 additional troops to San Francisco.

Mr. E. H. Harriman, President of the Union and Southern Pacific roads, started from New York for San Francisco on the day of the disaster, taking a 25-hour train to Chicago and a special from that city; and he crossed the continent in about 87 hours, making the trip from Chicago in about 62 hours.

Foreign Railroad Notes.

In Russia the railroads collect storage on freight received at stations and not removed after a certain short time. During the recent railroad strike, when the railroad employees refused to unload the cars and made it impossible for consignees to take away their freight, the storage bills ran up to considerable sums, and the consignees protested. But the railroad authorities have refused to abate the storage charges.

On the main lines of the German Railroad Union in 1903 there were 11,621 miles of track laid on iron sleepers, which was 16 per cent. of the total track. Thousands of miles of this have existed for 20 years or more and they offer an experience unequaled elsewhere in the world. In many cases the iron ties have not lasted as long as the wooden ones, but the advocates of iron claim that this has been due to improper form and construction.

The Prussian Ministry of Public Works calls the attention of the several railroad directories to certain defects which have been found in the superheated steam locomotives and of the means taken to remedy them. In the steam chest of the Schmidt superheater the projecting ends of the steam tubes rust easily, and the crown-plates of the superheating chamber become distorted and leak. To prevent rusting of the tube-ends one directory has introduced drainage channels with valves into the steam box, and these valves open when steam is cut off. It has also strengthened the crown plates. Other directories are advised to experiment with these methods on several engines and to report the result at the end of the year.

The earnings of the Italian State Railroads for the first half year of their operation by the government, that is, for the last half of 1905, were about 6 per cent. greater than in the corresponding half of the previous year. Great complaints are made of the irregularity of their working, which is largely charged to a totally inadequate equipment; the operating companies not having provided for the growth of traffic after their contract expired, and the government apparently not appreciating that fact. The government in January was negotiating with the four Italian works which build locomotives for 305 new engines, they, the works, accepting the prices for which 50 engines were contracted for with foreign works, plus the duties.

GENERAL NEWS SECTION

NOTES.

The Delaware, Lackawanna & Western has bought large tracts of land at Alden, N. Y., on which to plant trees for timber.

The newspapers say that in consequence of a new law intoxicating liquors are to be no longer sold on the cafe, buffet or dining cars of the Pennsylvania.

According to the *Toledo Blade*, Good Friday was this year recognized on the Pennsylvania Lines, for the first time in their history, by a suspension of local freight traffic.

The Fall River Line announces that the fare between New York and Boston is to be restored on the first of May to $4. Since last fall this fare has been twice reduced, first to $3 and very soon afterward to $2.

The Court of Appeals of the State of New York has sustained the act of the last Legislature, which took from the Board of Aldermen of New York City the power to grant railroad franchises and gave it to the Board of Estimate and Apportionment.

The State Railroad Commissioners of Texas have issued a rule empowering railroads to add 10 per cent. to the bill for the transportation of any freight which the shipper has under-billed or misdescribed for the purpose of securing an advantage over the carrier.

J. C. Lincoln, Assistant Freight Traffic Manager of the Missouri Pacific, has been appointed Traffic Commissioner of the St. Louis Traffic Bureau, and P. W. Coyle is to be Freight Traffic Commissioner of the St. Louis Business Men's League. Mr. Coyle is assistant General Freight Agent of the Wabash.

The Southern Pacific is to separate the freight claims departments from the traffic departments and will appoint freight claim agents in New Orleans, Houston and San Francisco for the lines having headquarters in those cities. Heretofore the claims have been handled by the general freight agents through claim clerks.

The Southeastern Passenger Association, at a meeting held in Chattanooga recently, voted to restrict the number of summer excursions out of commercial centers on account of the complaints of manufacturers that their workmen are too free in taking unauthorized vacations. It was the sense of the meeting that only one such excursion should be run by each of the roads out of any city.

In the case of the Planters' Compress Company against the Missouri, Kansas & Texas, the Interstate Commerce Commission, in an opinion by Chairman Knapp, has decided, in accordance with its former decision in the case brought by the same complainant against the C., C., C. & St. L., that the application by the carriers of uniform rates on cotton in any quantity and their refusal to concede lower rates based upon car loadings, is not in violation of the regulating statute. A dissenting opinion was filed by Commissioner Prouty.

The Interstate Commerce Commission this week continued at Washington its inquiry into the coal and oil traffic on the principal railroads. An officer of the Norfolk & Western testified to an arrangement by which, it appears, his road and the Chesapeake & Ohio had agreed to a division of the coal traffic going to Richmond and to Norfolk. To Richmond the Norfolk & Western makes a rate 25 cents higher than that of the C. & O., thus giving most of the business to the C. & O.; to Norfolk the C. & O. rate is 25 cents higher than that of the N. & W. Asked if this was the result of a definite agreement, the witness was not well informed.

British Railroad Accidents in 1905.

The report of the British Board of Trade for the 12 months ending December 31 last shows 39 passengers, six employees and one other person killed and 396 passengers, 112 employees and eight other persons injured in train accidents during the year. The accidents from other causes, including casualties to persons passing over railroads at level crossings, and trespassers, bring the total casualties for the year up to 1,100 killed and 6,460 injured, as compared with 1,073 killed, 6,889 injured in 1904. The number of fatal injuries to passengers in train accidents in 1904 was six, or less than one-sixth of the number in 1905.

Stakes for Lumber.

Officers of the National Association of Lumber Dealers, which has brought suits against certain railroads to compel them to supply stakes for cars of lumber, held a conference with officers of the defendant roads at Pittsburg, Pa., last week, and as a result the roads are going to equip 80 gondola cars with a "telescopic" steel car stake; and if these prove satisfactory, it is expected that an agreement will be reached to use them generally. It is probable also that 100 platform cars will be fitted with a receptacle beneath the floor for holding stakes. It is proposed to have the receptacle sealed so as to prevent misuse or loss of the stakes when the cars are used for commodities not needing stakes.

United States Steel Corporation.

The report of the United States Steel Corporation for the quarter ended March 31 shows net earnings of $36,634,490, an increase of $13,500,000 over the earnings of the corresponding period in 1905, and the largest ever reported for a first quarter. The unfilled orders on hand on April 1 were 7,018,712 tons, an increase of 1,421,152 tons, as compared with April 1, 1905. The surplus for the quarter, after dividends, was $16,067,000. About two-thirds of this has been appropriated for additional property, for construction and for the discharge of capital obligations. At the annual meeting plans were presented for the new steel mills of the Indiana Steel Company, and for the construction of the new model town of Gary, Ind., where the new plant is to be built. Over 5,000 acres of land have been acquired on the shore of Lake Michigan, and a square mile of this land is to be used for the steel mills alone. There will be 16 blast furnaces, 84 open hearth furnaces and 34 rolling mills. It is expected that the annual output of rails will be about 900,000 tons a year. The foundries will produce about 3,000,000 tons of pig iron, and from 2,500,000 tons to 2,700,000 tons of steel annually. The company's fleet on the Great Lakes will be increased to carry the additional freight and the Lake Shore & Michigan Southern, the Pennsylvania, the Wabash, and the Baltimore & Ohio, will all run tracks to the mills. The works will employ 15,000 men, and the new city should, within four years, have a population of 100,000. The estimated cost of the plant is $75,000,000, and it is expected that it will be in operation in three or four years. Work has already begun.

A $60,000 Fine.

At Chicago April 20, fines aggregating $60,000 were imposed on the Chicago, Burlington & Quincy by the United States District Court, Judge S. H. Bethea presiding. The offense was an unauthorized reduction in the rates on tin plate to Vancouver, B. C. The counsel for the road admitted the violation of the law, but said that the low rate was made to promote American industry. A fine of $40,000 was imposed on the railroad company; $10,000 on Darius Miller, Traffic Manager, and $10,000 on C. G. Burnham, Foreign Freight Traffic Manager. The tin plate was shipped by the United States Steel Products Export Company. The counsel for the road said: "Careful investigation of the prices at which tin plate was being sold in British Columbia and of the freight rates from British ports by steamers and sailing vessels convinced us that in order to compete not only would it be necessary for the American manufacturer to sell very close to the cost price, but also for the railroads to make a very considerable reduction in rates from mills to British Columbia points. The result of arrangements made by the railroads with the shipper was to promote American trade with injury to no American interest.

"When it is remembered that the Government itself gives a rebate of 99 per cent. of the duty paid on imported tin plates when they are manufactured into cans and exported in order to protect the American manufacturer against his foreign competitor, the departure from the tariff in this case finds full justification in principle, if not in law."

Judge Bethea in passing sentence said: "Most of the suggestions made by counsel for the defendants applies to the law-making power, and not to the enforcement of the existing laws. It may be true that the law should be different, but I think it the duty of the court to enforce the law as it stands, and I must look at it in that light. There is too much practice in this country of people obeying what laws they please, and not obeying them all. . . . It is not for me to say that a fine will be a sufficient deterrent to others. If there was a provision for imprisonment in the penitentiary, much more in that way might be accomplished. . . . The defendants will stand committed until fines and costs are paid."

The fine was paid promptly, the defendants going to the office of United States Marshal Ames, where a check was made out for the full amount of the three fines. Under the law, the court could have assessed a fine of from $1,000 to $20,000 under each of the six counts in the indictment.

Newark and New York.

The Public Service Corporation of New Jersey, which operates the electric street railroads of Jersey City and of Essex and Hudson Counties, has made an agreement with the Pennsylvania Railroad and the McAdoo tunnel interests by which it promises to abandon its own plans for a special Jersey terminal and high-speed line to Manhattan. By this agreement the Pennsylvania Railroad

and the "Hudson Companies" (the McAdoo tunnels) will join in building a high-speed electric line that will take passengers of the Pennsylvania at Harrison, and of the Public Service Corporation at Park Place, Newark, and land them in Manhattan, at Church and Cortlandt streets, in 15 minutes. These two companies are to co-operate in building the main Jersey terminal at Harrison, just east of Newark. The Public Service Corporation has transferred to a real estate company owned by the Pennsylvania its large terminal site on Park Place, Newark, and agrees to operate its surface systems both in Essex and Hudson Counties so as to facilitate the transfer of passengers as conveniently as possible to the stations of the high-speed line. The line is expected to be finished and in operation in 1908.

Manufacturing and Business.

Frank H. Taylor, Vice-President of the Westinghouse Electric Company, has resigned.

The T. H. Symington Company has moved its Chicago office to 616-618 Railway Exchange.

The King-Lawson Car Company has moved its New York office from 32 Broadway to 17 State street.

The Young-Mann-Averill Company, Chicago, has moved from the Railway Exchange to Orchestra Building, 168 Michigan avenue.

The New York office of B. M. Jones & Co., Inc., has been moved from 143 Liberty street to Rooms 507 and 508, Washington Life Building, 141 Broadway.

The American Blower Company, Detroit, Mich., has been given an order by the New York, Ontario & Western for a good-sized heating outfit at Middletown, N. Y.

H. G. Ganson, formerly in the sales department of the Pullman Company, has been appointed Manager of the Car Department of M. H. Treadwell & Co., Lebanon, Pa.

Geo. P. Nichols & Bro., Chicago, makers of transfer tables, turntable tractors, drawbridge machinery, etc., will after May 1 be located at 1090 Old Colony Building.

L. F. Bower, formerly Manager of the electrical works of the Allis-Chalmers Co., in Cincinnati, has been appointed Comptroller of the company, with office at Milwaukee. Mr. Bower was born in Pennsylvania and graduated from Wesleyan University in 1879. For the next five years he was in the Treasurer's office of the Jackson & Woodin Manufacturing Co., at Berwick, Pa. He then became Principal of the Preparatory Department of Dickinson College at Carlisle, Pa., but after three years started a company there to make chains. He soon sold out his interest in this to the Standard Chain Co., and was then made superintendent of the car department of the Allison Manufacturing Co., of Philadelphia. In 1890 he was appointed manager and treasurer of the Carlisle Manufacturing Co., maker of cars and other railroad equipment. From 1896 to 1901 Mr. Bower was Secretary and Treasurer of the Dickson Manufacturing Co. (locomotive works), of Scranton, Pa. He remained manager of the machinery department of this plant when it was absorbed by the Allis-Chalmers Co., in 1901. In 1904 he went to Cincinnati as Secretary and Treasurer of the electrical department, and was appointed Manager in 1905. While at Scranton Mr. Bower was admitted to the bar of Lackawanna county.

L. F. Bower.

The Dayton Pneumatic Tool Company, Dayton, Ohio, has opened branch offices at 707 and 708 Lincoln Trust Building, St. Louis, Mo., with J. A. Prescott, Southwestern Manager, in charge.

C. Frank Schwep, who has been at the head of the purchasing department of the Ingersoll-Sergeant Drill Co. for the past 13 years, has been appointed General Purchasing Agent of the Ingersoll-Rand Company, with office at 11 Broadway, New York.

W. M. Wilson has been appointed Western representative at Chicago of the Flannery Bolt Company of Pittsburg, Pa. T. R. Davis has been appointed mechanical expert and traveling representative.

E. H. Sniffin and Arthur West have been elected to the new offices of Third and Fourth Vice-Presidents, respectively, of the Westinghouse Machine Company. Mr. Sniffin will be in charge of the sales department as heretofore. Mr. West, who has been Chief Engineer of the company, retains that title and position. William A. Bole, in consequence of his election to the Vice-Presidency of the Westinghouse Foundry Company, has resigned as Manager of Works of the Westinghouse Machine Company, but has been made Consulting Engineer. Henry L. Barton, formerly General Superintendent of the East Pittsburg works of the Machine Company, succeeds Mr. Bole as Manager of Works.

Iron and Steel.

The U. S. Steel Corporation's price for rails will remain $28 per ton during 1907.

Contracts for railroad bridges recently placed called for about 10,000 tons of structural steel. The Lehigh & Erie will use 3,500 tons for bridges in western New York, which contract has been given to the American Bridge Co.; the Chicago & North-Western has given contracts to the Pennsylvania Steel Co. for 1,500 tons; the Buffalo, Rochester & Pittsburg for a similar amount to the McClintic-Marshall Construction Co., and the Chicago, Milwaukee & St. Paul for 1,400 tons to the Wisconsin Bridge Co. The Chicago Bridge & Iron Works also has an order for 900 tons of steel.

The Louisville & Nashville has let a contract for 42,000 tons of rails to the Tennessee Coal & Iron Co., and the Erie has given a contract for 4,000 tons of structural steel for a large viaduct. The Pennsylvania Steel Co. will furnish 5,200 tons of fabricated steel for a bridge on the New York & Long Branch Railroad. The Buffalo, Rochester & Pittsburg has given an order for 2,000 tons of rails to the Cambria Steel Co. The New York Central has ordered 20,000 tons of rails, and is in the market for more. The Southern Pacific has ordered 25,000 tons, and the Lima & Toledo Traction Co. 13,000 tons; the Southern has ordered 60,000 tons from the Tennessee Coal & Iron Co., for 1907 delivery. The Tennessee Coal & Iron Company's orders aggregate nearly 150,000 tons of rails. The large amount of steel which will be required to rebuild San Francisco will create a demand which it may be impossible to meet in this country. The Carnegie Steel Co., and the Jones & Laughlins Co., it is said, have orders for all that they can make in the next eight months.

OBITUARY NOTICES.

W. M. S. Dunn, who died recently at his home in Nelson County, Virginia, was, up to 1889, General Superintendent and Engineer of the Chesapeake & Ohio. During the Civil War he was in the Engineering Corps of the Confederate Army, and was later for several years Engineer and Superintendent of part of the Richmond & Danville, now the Southern.

Benjamin Collins, one of the oldest bridge builders in the country, died at Dover, N. H., on March 24, at the age of 85. In 1839 he, in partnership with the late Thomas H. Cushing, built some railroad bridges for the state of Illinois. Between 1840 and 1855 the firm built many bridges on different railroads in New England, including the Boston & Maine, Vermont Central, and the Fitchburg. Mr. Collins continued this work until Mr. Cushing's death in 1868. He also practiced as a civil engineer and surveyor, making both railroad and land surveys, and was an authority on Howe truss bridge construction.

C. M. Bennett, Inspector of Maintenance of Way on the Southwest System of the Pennsylvania Lines West, died recently at Urbana, Ohio. Mr. Bennett began railroad work in the Engineering Department of the Pennsylvania, and after a few years was appointed Engineer of Maintenance of Way of the Pittsburg division of the Pittsburg, Cincinnati, Chicago & St. Louis. He was later made Superintendent of the Indianapolis division, and in 1890 was promoted to be Superintendent of the Southwest System at Logansport, Ind. Three years later he was Superintendent of the Cincinnati & Muskingum Valley, a subsidiary of the P., C., C. & St. L. He resigned from this office at the end of 1904 on account of ill health and was then appointed to the position which he held at the time of his death.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Franklin Institute.

At a meeting of the sections April 26, a paper on High Pressure Steam Tests of a Locomotive Injector, by Strickland L. Kneass, was presented.

The Railway Signal Association.

The next meeting of this Association will be held at the Grand Union Hotel, New York, Tuesday, May 8, at 10.30 a.m. The new constitution, which was presented at the March meeting in Chicago and corrected, will be brought up for final adoption. Papers will be presented by L. R. Clausen (C., M. & St. P.), on "The Upward

Indication of the Semaphore Arm"; by W. H. Arkenburgh (U. P.), on "Electric Locking at Electric Interlocking Plants"; by H. W. Lewis (L. V.), on "Substitution of Track Circuits for Detector Bars," and by J. M. Waldron (Interborough Rapid Transit), on "Alternating Current Track Circuits in the New York Subway."

Iron and Steel Institute.

The annual meeting of this institute will be held at the Institute of Civil Engineers, Great George street, Westminster, London, May 10 and 11. At this meeting the Bessemer gold medal for 1906 will be presented to Floris Osmond, of Paris, and the awards of the Andrew Carnegie gold medal and Research Scholarship for 1906 will be announced. The papers to be presented include:

"The Influence of Silicon, Phosphorus, Manganese and Aluminium on Chill in Cast Iron," by E. Adamson (West Hartlepool).
"The Influence of Manganese on Iron," by Prof. J. O. Arnold (Sheffield).
"The Relation between Type of Fracture and Microstructure of Steel Test Pieces," by C. O. Bannister, Assoc. R. S. M. (London).
"Compression of Steel Ingots in the Mold," by A. J. Capron, M. Inst. M. E. (Sheffield).
"The Manufacture of Rolled Solid Steel Car Wheels and Tires," by P. Eyermann (Wisconsin).
"Brittleness in Thin Steel Sheets," by E. F. Law, Assoc. R. S. M. (London).
"Chainmaking Machinery," by E. Lelong (Couillet, Belgium).
"The Use of Oxygen in Removing Blast Furnace Obstructions," by C. de Schwarz (Liége).
"Volume and Temperature Changes Occurring During the Cooling of Cast Iron," by Prof. Thomas Turner, M. Sc., Assoc. R. S. M. (Birmingham).
"The Influence of Copper in Steel," by F. H. Wigham (Wakefield).

The following reports on work carried out during the past year by holders of Carnegie Research Scholarships will be submitted:

"Hardness of the Constituents of Iron and Steel," by Henry C. Boynton, D. Sc. (Cambridge, U. S. A.).
"Heat Treatment of Wire," by J. Dixon Brunton (Musselburgh).
"Quarternary Steels," by L. Guillet, D. Sc. (Paris).
"Influence of Carbon on Cast Iron," by W. H. Hatfield (Sheffield).
"The Preparation of Carbon-free Farromanganese," by E. G. Ll. Roberts and E. A. Wright, Assoc. R. S. M. (London).
"Deformation and Fracture in Iron and Steel," by Walter Rosenhain, B. A., B. C. E. (Birmingham).

Arrangements have been made to hold a joint meeting of members of the American Institute of Mining Engineers and of the Iron and Steel Institute in London, commencing July 23, 1906. The London Reception Committee will provide entertainments and excursions. Meetings will be held for the reading and discussion of papers on the mornings of July 24, 25 and 26, and visits will be made in the afternoons. A reception will be given by the Lord Mayor at the Mansion House on the evening of July 24. On the evening of July 25 there will be an entertainment at the Earles-Court Exhibition, and on the following evening at the Crystal Palace. On July 27 the annual dinner of the institute, to which the American visitors are invited, will be held at the Guildhall, and on the following day a visit will be made to the glass furnaces of Butlin & Co., at Wellingborough. After the London meeting the American visitors will go to York, Middlesborough, New-Castle-on-Tyne, Glasgow, and Edinburgh. An alternative excursion for the American visitors has also been arranged; to the summer meeting of the Institute of Mechanical Engineers at Cardiff. Bennett H. Brough, 28 Victoria street, London, S. W., is Secretary.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Pennsylvania.—J. S. Donaldson, Assistant Auditor of Miscellaneous Receipts and Accounts, has been appointed Auditor of Miscellaneous Receipts and Accounts. F. E. Shallenberger succeeds Mr. Donaldson.

Texas & Gulf.—W. C. Nixon, Second Vice-President and General Manager of the Gulf, Colorado & Santa Fe, has been elected also President of the T. & G., succeeding G. M. D. Grigsby. J. H. Keefe, assistant to Mr. Nixon, has been elected Vice-President and General Manager, succeeding, as Vice-President, W. B. Ward. G. A. Rogers has been elected Secretary and Treasurer, succeeding F. T. Rembert.

Operating Officers.

Missouri Pacific.—T. E. Byrnes, Inspector of Transportation, has been appointed Superintendent of Transportation, with office at St. Louis, Mo., succeeding W. C. Watrous, resigned.

Oregon Railroad & Navigation.—L. F. Pennington, Chief Despatcher at Starbuck, Wash., has been appointed Acting Assistant Superintendent at that place, succeeding D. B. Smith, resigned.

Traffic Officers.

Chicago, Milwaukee & St. Paul.—G. S. Marsh, First Assistant General Passenger Agent, has resigned.

Nashville, Chattanooga & St. Louis.—E. T. Eckles, chief rate clerk of the Freight Traffic Department, has been appointed to the new position of Assistant General Freight Agent.

Texas & Gulf.—C. L. Taylor, Auditor and General Freight and Passenger Agent, has been appointed Traffic Manager.

Lehigh Valley.—H. C. Burnett, who was recently appointed General Freight Agent, began railroad service in 1883 as a clerk in a freight office of the Denver & Rio Grande. In 1887 he went to the Colorado Midland as Agent at Leadville, Colo., and in 1891 was made General Agent at Salt Lake City. Two years later he was appointed to the same position on the Atchison, Topeka & Santa Fe, and in 1896 went to the South Jersey. In 1898 he went to the Lehigh Valley as Division Freight Agent at Buffalo, where he remained for six years. He then went to New York as Assistant General Freight Agent, which position he held until his recent promotion. J. S. Wood has been appointed Assistant General Freight Agent at New York, succeeding Mr. Burnett, effective May 1.

H. C. Burnett.

Engineering and Rolling Stock Officers.

Atchison, Topeka & Santa Fe.—W. F. Buck, recently appointed Mechanical Superintendent of the Eastern Grand division, entered railroad service as a machinist on the Northern Pacific. In 1893 he was made shop foreman on that road, and two years later general foreman of shops at Missoula, Mont. In 1899 he was transferred, with the same title, to Helena, Mont., and three years later was made Master Mechanic of the Rocky Mountain division. In 1904 he went to the Atchison, Topeka & Santa Fe as Master Mechanic at Needles, Cal., where he has been until his recent promotion.

Erie.—G. H. Burgess, Assistant Engineer, has been appointed Engineer of Terminal Improvements, with office at New York.

Kansas City Southern.—W. H. Bush, Assistant Engineer at Pittsburg, Kan., has resigned to become Chief Engineer of Construction of the Louisiana Central, with office at New Iberia, La.

LOCOMOTIVE BUILDING.

The Alabama Great Southern, it is reported, has ordered a number of new locomotives.

The Maryland Steel Co., Philadelphia, Pa., has ordered two saddle tank switching locomotives from the Baldwin Locomotive Works.

The National of Mexico has ordered 12 consolidation and three six-wheel switching locomotives from the Baldwin Locomotive Works.

The National Lines of Mexico have ordered one Pacific balanced compound passenger locomotive from the Baldwin Locomotive Works for purposes of trial.

The Lima Locomotive & Machine Co. reports the following orders during the last week for Shay locomotives: Lee Lumber Co., Louisiana, one 45-ton locomotive; E. R. Spotswood Lumber Co., Lexington, Ky., one 10-ton locomotive, and the Bell Logging Co., of Deepwater, Wash., one 37-ton locomotive.

The Mexican International has ordered 15 consolidation locomotives from the Baldwin Locomotive Works and five Pacific passenger locomotives, one of which will be a balanced compound from the American Locomotive Co. This balanced compound locomotive has been ordered for experimental purposes.

The New York, Chicago & St. Louis has ordered 10 simple consolidation (2-8-0) locomotives and five simple 10-wheel (4-6-0) locomotives from the Brooks Works of the American Locomotive Co., for October delivery. The consolidation locomotives will weigh 157,100 lbs., with 138,600 lbs. on the drivers; cylinders, 19 in. x 28 in.; diameter of drivers, 62 in.; radial stayed extended wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 2,417 sq. ft.; 306 Worth tubes, 2 in. in diameter and 14 ft. 9¾ in. long; firebox, 90 in. x 74 in.; grate area, 46.25 sq. ft.; tank capacity, 5,500 gallons, and coal capacity, 14 tons. The 10-wheel locomotives will weigh 136,500 lbs.,

with 105,600 lbs. on the drivers; cylinders, 19 in. x 24 in.; diameter of drivers, 62 in.; radial stayed extended wagon top boiler, with a working steam pressure of 180 lbs.; heating surface, 1,783 sq. ft.; 244 tubes, 2 in. in diameter and 13 ft. ⅛ in. long; Otis steel firebox, 102⅛ in. long and 40¼ in. wide; grate area, 28.54 sq. ft.; tank capacity, 5,500 gallons, and coal capacity, 14 tons. The special equipment for both includes: Westinghouse air-brakes, Sansom bell ringer for 10-wheel locomotives, Keasbey & Mattison boiler lagging, Sterlingworth brake-beams, Corning brake-shoes and Climax couplers for 10-wheel locomotives, Tower couplers for consolidation locomotives, Star headlights, Monitor injector, Magnus journal bearings, U. S. piston and valve rod packings, Kunkle safety valve for consolidation locomotives, Star safety valve and steam gages for 10-wheel locomotives, Leach sanding devices, Nathan sight-feed lubricators, Railway Steel-Spring Co.'s springs, Crosby steam gages for consolidation locomotives, and Midvale driving wheel tires.

CAR BUILDING.

The Central of New Jersey is building a business car in its Elizabethport shops.

The Alabama Great Southern, it is reported, has ordered 2,000 freight cars.

The Western Maryland, it is reported, is asking prices on 500 steel hopper coal cars.

The Missouri, Kansas & Texas has ordered 10 chair cars and 10 baggage cars from the American Car & Foundry Co.

The Duluth & Northeastern has ordered 50 flat cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Alabama & Vicksburg has ordered 150 box cars of 60,000 lbs. capacity from the American Car & Foundry Co.

The Nashville, Chattanooga & St. Louis has ordered 500 wood underframe box cars from the American Car & Foundry Co.

The Minneapolis & St. Louis has ordered three 60-ft. combination mail and baggage cars from the American Car & Foundry Co.

The Chicago & Alton has ordered 700 additional box cars and 2,000 freight and refrigerator cars from the American Car & Foundry Co.

The Toledo, St. Louis & Western has ordered 750 wood underframe box cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The White Pass & Yukon Route, it is reported, will shortly build a branch line, and will need additional equipment, especially second-hand cars.

The National of Mexico denies having ordered 300 additional box cars from the American Car & Foundry Co., as reported in our issue of April 20.

The Vicksburg, Shreveport & Pacific has ordered 150 box cars and 50 hopper coal cars, all of 60,000 lbs. capacity, from the American Car & Foundry Co.

The Barrett Manufacturing Co., Chicago, has ordered 30 tank cars of 10,000 gallons capacity from the American Car & Foundry Co., to weigh 100,000 lbs.

The Jeanerette Lumber & Shingle Co., Jeanerette, La., has ordered eight logging cars of 80,000 lbs. capacity from the Marshall Car Wheel & Foundry Co.

The Cincinnati, New Orleans & Texas Pacific has ordered 500 box cars, 12 first-class coaches, and six baggage cars from the American Car & Foundry Co. and is reported as about to order additional freight cars and a large amount of other equipment amounting in all to about $4,000,000.

The New Orleans & Northeastern, as reported in our issue of April 6, has ordered 600 box cars of 60,000 lbs. capacity; 200 flat cars of 80,000 lbs. capacity, and 150 double hopper coal cars from the American Car & Foundry Co.

The Southern has ordered twenty-five 61-ft. combination baggage and express cars; four 70-ft. combination baggage, mail and express cars; six 65-ft. passenger and baggage cars, and ten 61-ft. postal cars from the American Car & Foundry Co.

The National of Mexico, as reported in our issue of March 9, has ordered three first-class vestibule coaches, three second-class vestibule coaches, there third-class vestibule coaches, and five combination baggage, mail and express cars from the Pullman Co. Pintsch gas is to be used in all these cars.

The St. Louis, Rocky Mountain & Pacific has ordered 100 gondola cars of 80,000 lbs. capacity, and 100 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., for September delivery. All cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The special equipment for both includes: American Car & Foundry Co.'s bolsters, Westinghouse brakes, Tower steel couplers, Miner draft rigging, Harrison dust guards, McCord journal boxes and Diamond arch-bar trucks.

The Houston Electric Co., Houston, Tex., has ordered 20 Brill semi-convertible grooveless post cars from the American Car Co., for June 15 delivery. These cars will weigh about 34,000 lbs., and measure 38 ft. long, over all. The special equipment includes: Brill axles, bolsters, brake-beams, brake-shoes, brasses, couplers, door fastenings, doors, draft rigging, dust guards, journal boxes, platforms, springs, trucks, vestibules and wheels, National Electric Co.'s air-brakes, Curtain Supply Co.'s curtain fixtures, Pantasote curtain material, Sherwin-Williams paint, Monitor roofs and Heywood seats.

The Dominion Atlantic has ordered 25 flat cars of 60,000 lbs. capacity and one conductor's van from Rhodes, Curry & Co., for June delivery. The flat cars will be 35 ft. long and 9 ft. 3 in. wide, over all, and 2 ft. 10½ in. high from top of rail to center of drawbar. The van will be 36 ft. long, 8 ft. 10 in. wide, over all, and 14 ft. 9 in. high to top of monitor. The special equipment for both includes: Simplex brake-beams, Christie brake-shoes for flat cars, Westinghouse brakes, Tower couplers, Miner draft rigging for flat cars, Ryan dust guards, Adams & Westlake light for van and Diamond trucks for flat cars.

The St. Louis & San Francisco has ordered 2,000 box cars of 80,000 lbs. capacity, 500 coal cars of 80,000 lbs. capacity, and 500 freight cars of 60,000 lbs. capacity, and 250 flat cars of 80,000 lbs. capacity. The box and furniture cars will be 40 ft. long, the stock cars will be 36 ft. long, and the flat cars will be 43 ft. long. All of the above will have steel underframes with the exception of the furniture cars, which will have steel center sills, and in addition to this the box cars will have a steel upper frame. Orders have also been placed with the American Car & Foundry Co. for 50 cabooses, and an order has been placed with the Pullman Co. for 10 chair cars and six combination mail and passenger cars.

BRIDGE BUILDING.

Arkansas.—Both Houses of Congress have passed the bill authorizing the Tyronza Central Railroad to build a drawbridge across Little river in this state. (April 13, p. 113.)

Atlanta, Ga.—The Southern has filed a bond with the city authorities, which insures the immediate building of the Nelson street bridge. The plans call for the building of a structure from Madison avenue to the western end of the present bridge. The contract for the work has been let to W. W. Griffin, and will be completed in about nine months.

Bellefouche, S. Dak.—Bids are wanted May 15 at the office of the United States Reclamation Service for building five steel highway bridges. R. F. Walter is Engineer in charge.

Bridgeport, Ont.—A new steel bridge will be erected here.

Camden, Tenn.—Bids are wanted May 22 by Judge W. T. Marris for building an iron bridge about 309 ft. long over Big Sandy river in Benton and Henry counties. W. D. Cooper is County Clerk.

Canton, Ga.—Bids are wanted May 19 by W. J. Webb, Ordinary, for building a steel bridge 242 ft. long in the county Cherokee.

Clarkville, Tenn.—The bill authorizing a bridge across the Cumberland river at this place has been passed by the U. S. Senate. (April 6, p. 105.)

Florida.—A bill is before the Committee on Interstate and Foreign Commerce of the House of Representatives authorizing E. L. Potter and others to build a bridge across the Halifax river in this state.

Goderich, Ont.—The Huron & Perth county council will build two steel bridges on the boundary between Grey and Elmer townships. Ansley & Donaldson, C. E., are preparing plans.

Grand Forks, N. Dak.—Bids are wanted by H. Anderson, County Auditor, May 5, for building all the steel bridges that may be needed in Grand Forks County for one year.

Indianapolis, Ind.—Bids are wanted May 7 by Captain B. F. Cheathan, Construction Quartermaster at Lawrence, Ind., for building a reinforced concrete arch bridge.

Kentucky.—The House of Representatives has passed the bill authorizing the Borderland Coal Co. to build a combined railroad, wagon and foot bridge across the Tug Fork of the Big Sandy river where it forms the boundary line between this State and West Virginia.

London, Ont.—The Grand Trunk, in connection with the work

of raising its tracks to avoid grade crossings, will build 10 concrete subways at this place.

MINNESOTA.—A bill has been introduced in the House of Representatives authorizing the Minnesota, Dakota and Pacific Railway Co. to build a bridge across the Missouri river.

MISSISSIPPI.—A bill was introduced in the House of Representatives on April 20 authorizing a bridge across the Tallahatchie river in Tallahatchie County, this State.

MONTREAL, QUE.—An overhead steel bridge is proposed to be built from Berrie street to the ferry landing at a cost of $15,000. The Parks and Ferries Committee oppose the building of this structure.

NASHVILLE, TENN.—The U. S. Senate has passed the bill authorizing Davidson County to build two highway bridges across the Cumberland river at or near this city.

PENNSYLVANIA.—On April 11 the United States Senate passed a bill authorizing the Fayette Bridge Co. to build a bridge across the Monongahela river between the counties of Fayette and Washington in Pennsylvania.

ST. CATHERINES, ONT.—A number of permanent bridges will be erected by the Niagara, St. Catharines & Toronto Railway.

ST. CHARLES, MAN.—The municipality is planning to build a steel suspension bridge over the Assiniboine river at a cost of $100,000.

SANDWICH, ONT.—Bids are being received for the erection of a steel riveted truss bridge, 120 ft. clear span, 16 ft. clear roadway, the bridge to be erected over the river Canard, between the townships of Anderson and Sandwich West, in the county of Essex, six miles from Amherstburg. John F. Miller, County Clerk of Essex, this place, may be addressed.

SOUTH OMAHA, NEB.—On April 10 a bill was introduced in the House of Representatives authorizing a bridge across the Missouri river at or near this place.

WASHINGTON, D. C.—The bridge to be built over the eastern branch of the Potomac river is to be 1,200 ft. long, with a drawer 100 ft. wide in the middle, and is to cost about $900,000.

Other Structures.

BIG SPRING, TEXAS.—The Texas & Pacific will shortly build new steel shops and a 40-stall roundhouse, for which plans have been completed. The company is also planning to build new steel shops and a 60-stall roundhouse for its Louisiana division at a point about 90 miles west of New Orleans. On this the work may be started shortly.

ELIZABETHPORT, N. J.—The Central of New Jersey has given the general contract to the Miller-Collins Co., of New York, for the foundations, structural steel, masonry, roofing work, etc., for its new boiler house and coal bins to be put up at this place.

HARAHAN, LA.—The Southern Pacific has under consideration the question of building large terminals at this place, and is also planning to remove its shops to the New Orleans side of the river near Harahan. The cost of these improvements will be about $3,000,000.

MANITOWOC, WIS.—The Wisconsin Central and the city officials are planning to let a contract for dredging the river at a cost of $80,000, preparatory to the building of a large coal dock by the Wisconsin Central. The proposed dock will be 1,000 ft. long and 400 ft. wide, and it will have a storage capacity of 250,000 tons and a handling capacity of 500,000 tons.

MEMPHIS, TENN.—All but four of the railroads interested in the proposed new union terminal passenger station, to be built at this place, have agreed to the plans, and the work is to be carried out under the name of the Memphis Railway & Terminal Co., which will be incorporated for this purpose. It is expected that an agreement will shortly be reached and the work started.

MONTREAL, QUE.—Work will soon be started on a large office building for the Grand Trunk Pacific here.

NEWPORT, VA.—The Chesapeake & Ohio, it is said, will put up a coal pier at this place, at a cost of $300,000.

PORT ARTHUR, ONT.—The Canadian Pacific will put up a large new passenger station here.

VALDOSTA, GA.—The Southern is putting up a new freight house here, to cost $15,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BRUSH CREEK & CROW'S RUN.—Incorporation has been granted a company under this name in Pennsylvania, with a capital of $100,000, to build a railroad from Park Quarries in Beaver County to North Sewickley, about 10 miles, forming a connecting link between the Fort Wayne at Conway and the B. & O. at North Sewickley. The incorporators are: D. W. McNaugher, E. Godfrey and others at Pittsburg.

CANADIAN NORTHERN.—This company has applied to Parliament for permission to build a line from its Toronto-Sudbury line to connect with the National Transcontinental.

Surveys being made for this company for its proposed line to Hudson's Bay have reached a point near the water shed of the Churchill river.

CANADIAN PACIFIC.—A contract has been given by this company to Hargrave Bros., of Winnipeg, for grading 40 miles of its Moose Mountain branch from Stoughton, Sask.

CENTRAL OF LOUISIANA.—Incorporation has been granted this company in Louisiana, with a capital of $1,000,000, to build a railroad from New Orleans west to the state line. C. C. Henshaw is President.

EASTERN RAILWAY.—A bill has been passed by the Nova Scotia House of Assembly authorizing U. A. Allen and A. A. Allen, of Montreal, and C. J. Coll, manager of the Acadia Coal Co., Stellarton, and associates to build a railroad along the eastern shore of Nova Scotia from Halifax to Guysboro, about 220 miles; also to build a branch from Stellarton to Country Harbor. Such a line will provide the Acadia Coal Co., with a tidewater terminal which can be used throughout the year. The company is incorporated for $2,000,000, and has been granted a loan of $2,000 per mile by the government.

GAINESVILLE & GULF.—This company, which operates 48 miles of railroad in Florida, from Fairfield north to Sampson City, has organized the Gainesville & Gulf to build a line from its northern terminus northeast to Jacksonville, about 50 miles.

GASSAWAY, ELK RIVER & HUTTONVILLE.—A charter has been granted a company under the above name in West Virginia to build a railroad from Gassaway, W. Va., south for a distance of 25 miles to Webster Springs. The incorporators are: E. B. Carlin and L. H. Kelley, of Sutton; T. M. Jackson, of Clarksburg; J. M. Hoover, of Webster Springs, and Elihu Hutton, of Huttonsville. The office of the company is to be at Clarksburg.

GRAND TRUNK PACIFIC.—A sub-contract has been given to M. C. Cance of Rainy River, Ont., for building some of the company's main line a few miles east of Saskatoon, Sask.

F. W. Morse, General Manager of this company, is quoted as saying that bids will soon be asked for building an additional 200 miles of its proposed road between Edmonton, Alb., and the Rocky Mountains. It is expected to have the road in operation between the Rocky Mountains and Fort William, Ont., in time to handle part of the 1907 crops.

GREAT NORTHERN.—A. E. Hogeland, St. Paul, Minn., is quoted as saying that he will start work next month laying track on the Similkameen line of this company, from Midway, B. C., to a point near Princeton, about 100 miles.

HARTWELL & WASHINGTON.—Incorporation has been granted a company under this name in Georgia to build a railroad 56 miles long through Hart, Elbert and Wilkes counties. The capital of the company is $250,000 and the incorporators are W. O. Jones, W. J. Anderson and others.

MADISONVILLE, HARTFORD & EASTERN.—This company has practically secured all the right of way for its proposed railroad to be built from Madisonville, Ky., northeast to Hartford, 60 miles. A bridge will be built over Green River in Ohio County.

MINNEAPOLIS & ST. LOUIS.—The stockholders of this company, at a special meeting, have approved the proposition of the directors to build, under the name of the Minnesota Dakota & Pacific, an extension from Watertown, S. Dak., to Le Beau, S. Dak., with a branch from Conde to Ecla in the same state, approximately 240 miles.

MINNESOTA, DAKOTA & PACIFIC.—See Minneapolis & St. Louis.

MONCLOVA & PANUCA.—According to reports from Monclova, Mex., work has been started on this proposed road, which is to be built from Monclova to Panuca, about 50 miles, at an approximate cost of $1,000,000. The road will furnish transportation facilities for the rich copper mines at Panuca.

NEW YORK, NEW HAVEN & HARTFORD.—An officer confirms the report that this company has bought 600,000 ft. of land fronting on Massachusetts avenue as a site for a freight terminal in Boston, Mass. Provision has been made for 23 tracks and a freight house 35 ft. x 150 ft., also for freight sheds between the several groups of tracks. The company intends to only lay 12 of these tracks at first and the remainder as the demand requires. It is expected to have the yard in operation in about three months.

NORTH & SOUTH TEXAS.—Bids are wanted May 10 for building

this line from Lufkin, Tex., southwest to Groveton, 35 miles. Surveys are being made and a right of way has been secured for two-thirds of the distance. P. A. McCarthy, of Lufkin, Tex., is Chief Engineer.

North River Railway.—A company under this name has been incorporated at Harrisonburg, Va., with a capital of $5,000, to build a railroad. R. M. Gillespie, of New York, is President, and C. B. Williamson, of Harrisonburg, is Secretary and Treasurer.

Oregon Roads.—Plans are being made to build an electric road from Portland, Ore., to Mount Hood, 46 miles, and up the slope of the mountain to the snow line. It is estimated that the cost of the road and equipment will be over $1,000,000. At the terminus on the mountain a hotel is to be built at an additional cost of $350,000. The names of the projectors are not given.

St. Louis & San Francisco.—This company has completed surveys for the proposed line from the Missouri river to New Orleans. It will be 171 miles shorter than that of any existing road from St. Louis to New Orleans. The line will be in three divisions, the end of the first division being at Shorepaugh. The maximum grades will be .3 per cent. The end of the second division will be at Mississippi crossing, and the maximum grades on this division will be .2 per cent. The end of the third division will be at New Orleans, on which the maximum grade will be .1 per cent. There will be no curves over two degrees. The line is to be completed in 1907.

Salina & Northwestern.—An officer writes that the proposed route of this road is from Salina, Kan., northwest through Saline, Lincoln, Mitchell, Osborne, Jewell, Smith and Phillips Counties, and through Franklin, Harlan, Phelps, Gosper, Dorson, Custer and Logan Counties in Nebraska, approximately 250 miles. Preliminary surveys, which were started two months ago, have reached Alton, Kan., and will be continued from that point to Kirwin and Phillipsburg, the line passing through Lincoln, Tipton and Osborne. The work is to be pushed as rapidly as possible. The contracts have not as yet been let. The maximum grade will be .6 per cent. going west, and .5 per cent. going east, with a maximum curvature of three degrees. George H. Whitcomb is President, J. W. Going Vice-President and C. Hamilton Secretary and Treasurer, Topeka, Kan. (April 13, p. 116.)

San Pedro, Los Angeles & Salt Lake.—Plans, it is said, are being made by Senator Clark and associates to build a railroad from a point on this road into Arizona, to connect with Senator Clark's copper mines at Jerome and eventually with the Southern Pacific in the southern part of Arizona. The proposed line will cross the Grand Canyon at Lees Ferry.

Shenango Valley Traction.—New York capitalists, who are interested in this road, are planning to extend the line from South Sharon, Pa., to New Castle, about 18 miles. The ties and rails have been bought and work is to be started shortly.

Southeastern Electric.—An officer writes that a contract has been let to E. H. Abodie & Co., of St. Louis, for building this proposed electric road from Chanute, Kan., to Coffeyville, also a line from Chanute to Galena. The work includes the building of four or five bridges. R. C. Rawlings is President and Mr. Stevens Chief Engineer, all of Kansas City. (See Kansas roads, April 13, p. 115.)

Strathcona Radial Tramway.—Application has been made by a company under this name for incorporation to build a number of lines from Strathcona, Alb. F. C. Jamieson, Strathcona, is Secretary and Treasurer.

Tioga & Clinton.—Incorporation has been granted this company in Pennsylvania, with a capital of $300,000, to build a railroad from Morris, Tioga County, to a point in Chatman township in Clinton County. The incorporators are residents of Lockhaven, which place is on both the Erie and the New York Central; and it is thought that the new road is to be connected with a line being built by the same interests further south.

White Pass & Yukon.—Announcement has been made by N. J. Heaney, the contractor, who built this Alaska road, that plans are ready for building an additional railroad in Alaska, to be financed by Close Bros., of London, and the W. P. & Y. interests. Work will shortly be started. The proposed route is from the coast to Orca, through the Copper River Valley, about 70 miles; thence into Fairbanks. G. M. Rice has been appointed Chief Engineer in charge of the construction.

RAILROAD CORPORATION NEWS.

Chicago, Milwaukee & St. Paul.—It is reported that this company has leased for 99 years that part of the road of the Columbia & Puget Sound which runs from Maple Valley, Wash., to Seattle, 23 miles. The St. Paul is to pay about $20,000 annual rental, a share of taxes and other fixed charges, and a share of the cost of building additional tracks when they are needed. This arrangement will not interfere with the regular train service of the C. & P. S., which is owned by the Pacific Coast Company. (See Pacific Coast Company, April 20, p. 124.)

Cincinnati, Hamilton & Dayton.—The receiver reports total receipts for the month of February $1,027,230, and total disbursements $1,053,149, leaving a deficit of $25,919. The surplus on hand on February 28 was $138,365.

Cleveland, Cincinnati, Chicago & St. Louis.—Gross earnings for the year ended December 31, 1905, were $22,517,763, an increase of $376,653; net earnings, $5,638,417, a decrease of $371,580. The surplus available for dividends was $1,870,424, a decrease of $508,411, leaving a surplus of $41,549 as compared with a surplus for the previous year of $759,298.

Grand Trunk.—This company has bought the Pembroke Southern, which runs from Pembroke, Ont., to Golden Lake, 21 miles, and has $107,800 capital stock outstanding. The purchase price was $150,000. The P. S. was leased to the Canada Atlantic, which the Grand Trunk took over last October.

Indiana, Columbus & Eastern Traction.—This company has been incorporated in Ohio with an authorized capital of $1,000,000. It is understood that it will take over the Appleyard lines and other roads recently acquired by the Schoepf syndicate. These lines are as follows: Central Market, 16 miles; Columbus, Buckeye Lake & Newark, 39 miles; Columbus, Newark & Zanesville, 42 miles; Columbus, Grove City & Southwestern, 15 miles; Columbus, London & Springfield, 75 miles, and Dayton, Springfield & Urbana, 57 miles. It is possible that the Urbana, Bellafonte & Northern and the Columbus & Lake Michigan will also be absorbed. It is announced that a line will be built from Dayton, Ohio, to Richmond, Ind., 40 miles, which will make the total system about 290 miles long and make, by connecting at Richmond, Ind., with other Schoepf lines, a through traction line between Zanesville, Ohio, and Terre Haute, Ind., 320 miles.

Minneapolis, St. Paul & Sault Ste. Marie.—Gross earnings of this road for the year ended December 31 were $10,209,593, an increase of $1,426,636, as compared with the figure for the year ended June 30, 1905; net earnings were $5,201,424, an increase of $921,074; and surplus, after charges, $2,870,392, an increase of $806,977.

Old Colony (N. Y., N. H. & H.).—The Massachusetts Railroad Commission has authorized this company to sell $500,000 additional stock for the purchase of the Nantasket Beach Railroad, and for general improvements. The Nantasket Beach has long been leased to the Old Colony, and last January the O. C. bought the road for 60 per cent. of the face value of the outstanding bonds.

Pacific Coast.—See Chicago, Milwaukee & St. Paul.

Pembroke Southern.—See Grand Trunk.

Pennsylvania & Ohio (Electric).—An officer of the Pittsburg & Lake Erie, which is controlled by the Lake Shore & Michigan Southern, has bought a majority of the $700,000 capital stock of the Pennsylvania & Ohio. It is said that it is intended to consolidate the P. & O. with the Ashtabula & Lake Shore Electric and the Woodland Beach Park Co., of both of which L. A. Robinson, the officer referred to above, is President.

Toledo, Canada Southern & Detroit.—This company has sold to J. P. Morgan & Co. $1,600,000 50-year first-mortgage 4 per cent. bonds, part of an authorized issue of $4,500,000. The proceeds are to retire the $1,500,000 7 per cent. bonds due January 1, 1906. The bonds are guaranteed by the Michigan Central, which leases the property from the Canada Southern, which owns all the $1,547,662 capital stock. This stock will be taken up by the Michigan Central in 1913. The T., C. S. & D. owns 59 miles of main line between Detroit and Toledo, and these bonds are a lien on this track, as well as on 94 miles of second track and sidings.

Toronto Railway (Electric).—The authorized capital stock has been increased from $7,000,000 to $8,000,000. The stock of this company was recently put on a 6 per cent. basis.

Trinity & Brazos Valley.—The Texas Railroad Commission has authorized the issue of $526,000 bonds covering 26 miles of completed road from Mexia, Tex., south.

Wabash.—The Supreme Court of Ohio has decided that the $600,000 7 per cent. equipment bonds of the Toledo & Wabash, issued in 1863 and due 1883, are a lien on the main line of the Wabash from Toledo, Ohio, to the Indiana state line. According to the statement of the plaintiff there can be no appeal from this decision. The Wabash is, under this decision, liable for nearly $4,000,000, this being the amount of the principal with compound interest since 1883 and the 7 per cent. coupons in default since 1875.